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Introduction

This manual describes a training exercise on mitigation and recovery after hurricanes. The exercise simulates selected aspects of recovery from hurricane damage. The stage is a single local government jurisdiction and the players are its key staff members. Players are guided in creating their own scenario of hurricane damage and then led through a series of tasks related to planning for repairs and rebuilding. Although the focus of the exercise is on hurricanes, it is fully applicable to mitigation and recovery after any damaging coastal storm, such as tropical storms, nor'easters, or major Pacific coast storms. This could be done simply by substituting the word "coastal storm" for the word "hurricane" throughout the manual.

This hurricane exercise stems from a research project funded by the National Science Foundation in the early 1990s to develop a way to train local government officials about long-term recovery and reconstruction after earthquakes. The research, conducted by Spangle Associates, Urban Planning and Research, culminated in a table-top training exercise for local government staffs. FEMA representatives attended pilot tests of the exercise and adopted it as part of its emergency management and mitigation training program. Subsequently, Martha Tyler, Principal Planner of Spangle Associates, and Clancy Philipsborn, President of The Mitigation Assistance Corporation, prepared similar exercises for floods and hurricanes. They created the hurricane exercise under a subcontract with Greenhorne & O'Mara managed by Vincent DiCamillo with FEMA funding. Elizabeth Lemersal of FEMA's Mitigation Directorate and Joe Bills of FEMA's Emergency Management Institute directed the project for FEMA. This exercise was tested successfully in Savannah, Georgia, in September 1996.

Why an Exercise?

Local police and fire departments know the value of exercises to help them prepare for potential disasters. Through such exercises, they develop techniques to handle extraordinary circumstances, make decisions under extreme pressure, and contain the impacts of a disaster to the extent possible. Experience demonstrates that preparing in advance improves performance when disaster strikes.

Weeks after a hurricane, circumstances are still extraordinary, decisions are made under extreme pressure, and the impacts continue rippling through the community. As the need for emergency responders decreases, a new group of local staff people--managers, planners, building officials, finance officers, and engineers--face mounting responsibilities. Shouldn't there be an exercise for them, too?

This exercise is primarily for this "second wave" of responders whose actions will play an important role in shaping the rebuilt community. It is designed to provide them with a preview of the issues and problems they will face in the hopes that, like the emergency responders, they will be better prepared to serve their community effectively after a hurricane.

How Does the Exercise Relate to Real Time?

The exercise takes 8 hours. During that time, players will complete tasks covering a time period extending from a hurricane warning received 24 hours before the hurricane to one or two years after the hurricane. The tasks are arranged in approximate time sequence starting with those that normally must be dealt with first. This linear time sequence of tasks oversimplifies a complex, real situation in which tasks often must be addressed simultaneously. The amount of time allocated to each task will seem too short. This simulates, to some degree, the pressure after a hurricane to do an incredible amount of work very quickly.

How Does the Exercise Relate to Actual Recovery?

Like any exercise, this one is selective. It consists of a series of interrelated tasks that local governments almost always must undertake after a hurricane. The common links are that all the tasks must be done by local government and all potentially affect options for repairs and rebuilding. Not all post-hurricane recovery tasks are included. For example, much of emergency response is not covered. Economic and fiscal matters are only tangentially included, although they certainly impact recovery. FEMA disaster assistance programs and requirements are not incorporated into the exercise, although you need to recognize that maintaining records for FEMA reimbursement of recovery costs is a huge post-disaster task for local governments.

The exercise does not convey local political realities that influence how each task is handled. Players will need to imagine the political context in their community as they are working the exercise. After hurricanes, local governments may enjoy a brief suspension of political rivalry. Distinctions between the responsibilities of public and private agencies, federal, state, and local governments, and city and county government departments may blur. Every organization and person will be working together to address common needs. But this does not last long. Pre-hurricane political problems will soon re-emerge to influence decisions about long-term recovery.

Time is an important post-hurricane issue. The public may perceive that repairs and rebuilding are taking too long. Anger and frustration stemming from feelings of helplessness will often be vented at local public officials, particularly planners and building officials, whose procedures may be seen as obstacles to the speedy repair or rebuilding of damaged homes and businesses. The recovery process is permeated by tension between the desire for speed and the need to take time to ensure responsible rebuilding.

The exercise deals with common aspects of hurricane recovery; however, the unexpected will happen. The failure of a seawall, for example, can mean rebuilding an entire section of the community. Key staff people may be out of town or ineffective under pressure. Bad weather may delay outside help or contribute to more damage and difficulties in responding. Contingencies like these are part of the context of recovery. By learning as much as possible about the "normal" tasks of post-hurricane recovery, local government staffs will be prepared to do these with more ease, giving themselves a better chance of handling the "abnormal" tasks effectively.

And finally, the exercise will give players the important advantage of forethought when they face the inevitable hurricane, enabling them to help their communities recover and rebuild more quickly and effectively. Not only will they be better prepared for recovery tasks, they will learn about the advantages of acting now to prevent hurricane damage.

What Are the Assumptions for the Exercise?

1. The city or county conducting the exercise prepares for emergency response, plans for community development, administers land development regulations, and issues building permits.

2. The community participates in the National Flood Insurance Program and has adopted a floodplain management ordinance meeting or exceeding the minimum criteria in the NFIP.

3. The players know their community well, but do not need to know much about hurricanes or recovery from hurricanes.

Facilitator's Instructions

Overview of Exercise Design

This exercise on mitigation and recovery after hurricanes is organized into a series of tasks which are to be completed in sequence. Each task, labeled by a letter (A-L), has a time limit ranging from 20 to 75 minutes. The tasks are in rough chronological order, but in reality, many would be occurring simultaneously. Each task covers, at least partially, an issue related to recovery that typically arises after a hurricane.

The exercise starts with a hurricane warning. Task A asks players to respond to the warning and determine areas to evacuate. They begin to record information on a base map of the community which is used throughout the exercise. Then in Task B, they open emergency shelters. The hurricane arrives in Task C during which the players create a damage scenario using their best judgment of the impacts of a real hurricane.

The next tasks, usually part of emergency response, concern managing the debris in Task D and restoring essential community services in Task E. Then, more information is collected about the damage in Task F. These actions set the stage for early recovery--finding temporary locations for displaced businesses and residents in Tasks G and H, adopting policies for repair of damaged buildings in Task I, and adopting procedures to process permits for repairs and rebuilding in Task J.

The emphasis then turns to planning for rebuilding with Task K to identify planning opportunities and develop a reconstruction plan. Finally, the exercise ends with Task L to define mitigation actions that can be taken beforehand to avert hurricane damage and prepare for long-term recovery and rebuilding.

All the tasks can be accomplished using typical local government background documents, such as the community plan and zoning ordinance, supplemented by handouts provided in this manual. A specific product or products will emerge from each task, often providing input to subsequent tasks.

Throughout, it is important to remember that the primary value of the exercise is in the process, rather than in the products. It is designed to educate staff members about their likely tasks after a damaging hurricane. They will be able to apply this basic knowledge to coastal storms varying in size and impacts. As with any exercise, it is a first step. Having learned something of the process and problems, players will need to take further actions to reduce potential damage and prepare for the tasks of rebuilding.

Overview of this Manual

This manual contains most of the information needed to conduct the exercise. The manual is divided into four sections: introduction, facilitator's instructions, exercise tasks, and slide index.

In the section *Exercise Tasks*, you will find a series of small tabs identifying each exercise task by letter. Behind each of these tabs is a script, a one-page instruction sheet for doing the task, and, for some tasks, handouts to be used by players during the task.

> ***Scripts.*** Each task is introduced with a scripted slide show. The script may be read or paraphrased. Each script tells what the task is, why it is important, and how it has been carried out after recent hurricanes or coastal storms. A one-line description of each slide accompanies each paragraph of the script. This line is in bold face italics and is not meant to be read aloud.
>
> ***Instructions.*** The instruction page for each task is to be duplicated and included in a packet for each player. This page states the purpose of the task and lists the materials that will be needed to complete it, including handouts. Then, the specific steps required to do the task are listed, followed by a description of the product or products the task will generate.
>
> ***Handouts.*** Handouts, too, should be duplicated and included in packets for the players. They provide information or are forms to be filled out as a product of the task.

The section of this manual labeled *Slides* contains an index to the slides and a list of slide sources.

Recommended Participants

The exercise has three categories of participants:

- ***Facilitator(s)***--the person or persons responsible for organizing the exercise, providing information to the players before, during, and after the exercise, and conducting the exercise.
- ***Players***--those carrying out the prescribed exercise tasks.
- ***Observers***--people invited to learn from the exercise by watching.

Who exactly should participate in each of these categories? The exercise is designed with the following assumptions about participation.

Facilitator(s). The facilitator should be skilled in running meetings and knowledgeable about hurricanes and coastal storm hazards, long-term recovery from hurricanes, and hurricane hazard mitigation. Someone from your state's emergency management agency or hazard mitigation office could facilitate the exercise for your community. The facilitator could also be the community's emergency services coordinator or other staff member. Because the exercise emphasizes planning issues during recovery, a community's city planner could be an excellent facilitator, either alone or working with someone with emergency management expertise. A consultant with appropriate qualifications is a possible choice. The facilitator must have the full support of the community's chief administrative officer and be authorized to ask assistance from staff members in preparing for the exercise.

Players. The players should include 8 to 12 local government senior staff members, selected by the city or county manager. Staff members, such as the planning director, building official, and public works director, who would be responsible for rebuilding recommendations after a hurricane must be involved. Other possible players are the city or county manager, emergency services coordinator, housing specialist, engineer, clerk, attorney, parks and recreation director, and any other staff person who would have recovery responsibilities. The police and fire chiefs need to be involved as the exercise deals with some emergency response issues. However, it is wise to alert them that this is not an emergency response exercise and that others on the staff will probably be taking the lead. Council members, local American Red Cross personnel, or business persons may be players. It is important to include those people who would be responsible for the tasks in the exercise after a hurricane, regardless of their formal titles or roles.

Observers. Allowing non-players to observe the exercise is an effective way to spread the benefit; however, it is optional. The decision would be made by the facilitator and the participating jurisdiction. Observers could be other staff members from participating departments, staff members from non-participating departments, elected or appointed local officials, and community representatives. Staff members from other nearby jurisdictions might also be invited. By including observers, a jurisdiction would be increasing the impact of the exercise as a learning tool.

Recommended Schedule

The exercise can be completed in an 8-hour day with a break for lunch. It is fast-paced, calling for intensive effort from the players during the playing period. The schedule is deliberately tight to give players some sense of the pressure and tension that would pervade such tasks after a real hurricane. It can be done in a single day as shown in the schedule below. However, it can be spread over two days, perhaps starting in the afternoon of the first day and finishing at noon on the second day. By doing this, the players have time to rest and bring fresh perspective to the important tasks which come later in the exercise.

EXERCISE SCHEDULE

			Minutes
8:00 - 8:30	Introductions/Explanations		30
8:30 - 9:10	Task A.	Warning and Evacuation	40
9:10 - 9:30	Task B.	Emergency Shelter	20
9:30 - 10:30	Task C.	Damage Scenario	60
10:30-10:50	*Break*		*20*
10:50-11:10	Task D.	Managing Debris	20
11:10-11:30	Task E.	Restoring Services	20
11:30-12:00	Task F.	Damage Assessment	30
12:00 - 1:00	*Lunch*		*60*
1:00 - 1:20	Task G.	Temporary Business Locations	20
1:20 - 1:40	Task H.	Temporary Housing	20
1:40 - 2:25	Task I.	Policies for Damaged Buildings	45
2:25 - 2:45	Task J.	Permit Processing	20
2:45 - 3:05	*Break*		*20*
3:05 - 4:20	Task K.	Reconstruction Planning	75
4:20 - 5:00	Task L.	Mitigating Hurricane Hazards	40

Materials Needed for Exercise

To conduct the exercise, you will need to assemble some readily-available supplies and standard local documents. Below are lists of materials needed for the exercise.

Supplies. Supplies include a slide projector, screen, marking pens, map overlay material (such as acetate, tracing paper, or mylar), tape, and push pins. A flip chart or blackboard is not necessary, but can be used, as a supplement to the handouts, to record information during the exercise. A display timer, such as a kitchen timer, is essential for you and the players to keep track of time during the exercise.

Base Maps. One or more copies of a base map of the community is essential. The map should be the largest scale available that can fit on the table. It should show the coastline, major properties, streets and bridges, important facilities, and, if available, parcel boundaries. If the community plans to evacuate residents to other communities, a regional map should also be provided. When a table-top sized base map does not show both the whole jurisdiction and individual parcels, you may need to select part of the coastline as a focus for the exercise and provide large scale maps covering the selected area. In this case, a map of the entire jurisdiction should also be provided for context and perhaps for use in some of the early tasks.

Documents. The instruction sheets contain a list of materials to use for each task. Most of these are common local government documents and should be readily available. If documents are not available, the tasks can still be done relying on the players' knowledge of the community. Documents to collect, if available, are:

- Flood Insurance Rate Map (FIRM) or most recent NFIP map
- information on previous hurricanes or damaging coastal storms
- community plan and plan diagram
- emergency response plan, including evacuation and shelter plans
- Coastal Zone Management Plan and coastal development regulations
- redevelopment or downtown plans
- zoning ordinance and maps
- procedures for processing planning and building permits
- lists of historic buildings

Other relevant materials, such as census data, housing plans, or economic development plans, may be useful and should be provided, if readily available.

Player Packets. You will need to provide each player with an exercise packet, containing 12 instruction pages and 11 handout pages. You may also wish to prepare packets for observers so they can follow the action. The packet pages should be clipped together (not stapled) or placed in a folder or binder. The pages should be collated according to the sequence of the tasks. Following is a list of the packet pages in the order they should be assembled.

Contents of the Player Packets

Handout 1	Exercise Schedule
Handout 2	Color Key for Mapping Information
Handout 3	Task Leaders and Other Assignments
Handout 4	Recommended Actions
Instructions	Task A. Warning and Evacuation
Handout A	Actions in Response to Hurricane Warning
Instructions	Task B. Emergency Shelter
Instructions	Task C. Damage Scenario
Instructions	Task D. Managing Debris
Instructions	Task E. Restoring Services
Instructions	Task F. Damage Assessment
Handout F	Damage Assessment
Instructions	Task G. Temporary Business Sites
Instructions	Task H. Temporary Housing
Instructions	Task I. Policies for Damaged Buildings
Handout I	Policies for Damaged Buildings
Instructions	Task J. Permit Processing
Instructions	Task K. Reconstruction Planning
Handout K	Planning Opportunities
Instructions	Task L. Mitigating Hurricane Hazards
Handout L1	Ways to Reduce Hurricane Losses
Handout L2	High-Priority Action to Reduce Hurricane Risk
Handout L3	Contacts for Technical and Financial Assistance

Suggestions for Conducting the Exercise

1. Select as players 8 to 12 high-level staff persons to form a small working group in which each player can interact freely with all others. Invite additional staff members to observe.

2. The success of the exercise depends on total concentration of all players for the entire day. If possible, arrange to conduct the exercise away from the normal work place to reduce chances for interruption.

3. The exercise is tightly timed. Let players know that they must be on time for the exercise and clear their schedules to prevent interruptions.

4. Find a room that can be darkened for showing slides. The room should have a table the players can sit around to work on the base map and a wall on which maps may be attached with tape or push pins.

5. Provide for refreshments during the breaks. Thinking burns up energy.

6. Exert control to keep the exercise on the time schedule. Discussion should be discouraged while you are reading the scripts. Discussion can take place while the players are working on the tasks.

7. Whenever possible, add a few local slides with brief descriptions to the slide presentations. Slides showing past hurricanes in the community, buildings on the coast, or elevated structures can be added at the appropriate places in the task introductions. Doing this can help the players see the local relevance of the many examples from around the country.

8. If the facilitator is not a staff member, he or she needs to secure the support of the jurisdiction's chief administrative officer and coordinate with a designated staff person. That staff person must be able to verify that the key players will commit the full day to the exercise and help with local arrangements.

Facilitator's Checklist

Checklist

Before Exercise

- ❑ Obtain authorization from CAO, council, or other appropriate body.
- ❑ Set date and time.
- ❑ Reserve meeting room.
- ❑ Determine players and arrange with the CAO for them to participate.
- ❑ Invite observers, if desired.
- ❑ Arrange for slide projector and screen.
- ❑ Provide materials for map overlays, pen, push pins, and tape.
- ❑ Assemble documents.
- ❑ Assemble player packets.
- ❑ Study task scripts and instructions.
- ❑ Acquire local slides and make additions to the script.
- ❑ Place the slides in order in slide carousels.

During Exercise

- ❑ Use the script and slides to introduce the exercise and each task.
- ❑ Tim the tasks and facilitate their timely completion.
- ❑ Answer questions and assist players with the tasks.
- ❑ Oversee listing of high-priority actions to reduce hurricane risk.

After Exercise

- ❑ Continue to work with players on actions to reduce hurricane risk.

Exercise Tasks

In this section, you will find a series of tabs identifying each exercise task by letter. Behind each of these tabs is a script, a one-page instruction sheet for doing the task, and, for some tasks, handouts to be used by players during the task.

Scripts. Each task is introduced with a scripted slide show. The script may be read or paraphrased. Each script tells what the task is, why it is important, and how it has been carried out after recent hurricanes or coastal storms. A one-line description of each slide accompanies each paragraph of the script. This line is in bold face italics and is not meant to be read aloud.

Instructions. The instruction page for each task is to be duplicated and included in a packet for each player. This page states the purpose of the task and lists the materials that will be needed to complete it, including handouts. Then, the specific steps required to do the task are listed, followed by a description of the product or products the task will generate.

Handouts. Handouts, too, should be duplicated and included in packets for the players. They provide information or are forms to be filled out as a product of the task.

SCRIPT -- INTRODUCTION TO TASKS
(15 minutes to read the script)

Slide 1. Hurricane Mitigation and Recovery--An Interactive Exercise for Local Governments

This is a hurricane mitigation and recovery exercise designed for local government officials. The exercise introduces you to some of the tasks you will face when a damaging hurricane strikes your community. It also applies to mitigation and recovery from other types of damaging coastal storms.

Slide 2. Exercise tasks

The exercise is organized as a series of twelve tasks to be completed in sequence. The tasks are listed on the screen. Each task is identified by a letter A through L.

The exercise starts with a hurricane warning. In the first task, Task A, you decide how to respond to the warning and what areas to evacuate. Then, in Task B, you determine how to provide emergency shelter for the people evacuated. The hurricane arrives in Task C and you determine its major impacts.

Next come typical tasks during emergency response--Task D clearing, removing and disposing of debris, and Task E restoring essential services to the community. Then, more information is collected about the damage in Task F. This task sets the stage for early recovery--finding temporary space for displaced businesses and residents in Tasks G and H and adopting policies and procedures for the repair, removal or rebuilding of damaged buildings in Tasks I and J.

The emphasis then turns to planning with Task K during which you prepare a reconstruction plan for a heavily damaged area. Finally, the recovery exercise ends with Task L. In this task, you recap the problems encountered in the previous tasks and detail high-priority actions that can be taken beforehand to reduce hurricane losses and prepare for rebuilding.

Slide 3. Exercise schedule

Here is a schedule of the exercise showing the amount of time allocated to each task. You each have a copy of this schedule in your packet as *Handout 1*. Times range from 20 to 75 minutes. The amount of time allocated to each task will seem much too short. This simulates, to some degree, the time pressure you will experience after a hurricane. In addition to time for the tasks, this introduction will take about 30 minutes and you will have a 20-minute break in mid-morning and mid-afternoon. One hour is allocated for lunch. The entire exercise will take until 5:00 this afternoon.

Slide 4. Exercise purpose

The primary purpose of the exercise--shown here--is to improve the ability of local governments to recover from damaging hurricanes. We think it will do so in the ways listed on the slide.

- Training non-emergency personnel in recovery tasks. Fire fighters and police officers receive training to prepare them to handle disasters; most other staff people rarely do. This exercise is designed primarily to train non-emergency staff in tasks that come after emergency workers are through.

- Passing on experience from cities that have rebuilt. Many jurisdictions have had damaging hurricanes. The exercise content draws from these experiences.

- Providing a chance for hands-on experience. The exercise gives you a chance to apply general information about recovery and rebuilding to your specific circumstances.

- Encouraging preparations for recovery and rebuilding. The exercise will help you see how you can prepare now to handle typical recovery tasks more effectively after a hurricane.

- Encouraging actions to reduce hurricane damage. Once you see how tough recovery will be, we think you will want to initiate actions now to reduce the potential damage in your community.

Slide 5. Topics not covered

The exercise covers mitigation and recovery after hurricanes and also applies to other types of damaging coastal storms. It emphasizes damage in the coastal floodplain from storm surge and wind. The exercise content is consistent with requirements of FEMA's National Flood Insurance Program.

Not all aspects of recovery are covered. The slide lists some significant omissions. Most of emergency response is not covered, such as search and rescue and medical care. Economic and fiscal matters are only tangentially included, although they certainly impact physical recovery. FEMA disaster assistance programs and requirements are not incorporated into the exercise, but you need to recognize that maintaining records for FEMA reimbursement of costs is a huge post-disaster task for local governments. Finally, the exercise does not convey local political realities. Players will need to consider local politics as they work the exercise. After hurricanes, local governments may enjoy a brief suspension of politics-as-usual, but this does not last long. Pre-hurricane political divisions will soon re-emerge to influence post-disaster decisions.

Slide 6. Hurricane recovery timeline

This is a timeline showing typical lengths of time to accomplish the tasks in the exercise after a real hurricane. The timeline is divided into three sections: 1) pre-hurricane warning shown in light blue, 2) short-term recovery running from the hurricane to about 2 months shown in beige, and 3) long-term recovery running from about 2 months to 2 years shown in gold. Actual rebuilding can take much longer than 2 years, and mitigating hurricane hazards is an ongoing process. Almost all of the tasks are started during early recovery, but many of them extend into long-term recovery. Today you get to do the tasks one at a time, but as you can see here, after a real hurricane, you will be doing many of them simultaneously.

In general, the tasks take longer after a hurricane than people expect. This means that you start recovery with unreasonable expectations. The public may perceive that repairs and rebuilding are taking too long. Anger and frustration is often be vented at local public officials, particularly planners and building officials, whose procedures may be seen as obstacles to the speedy repair and rebuilding of damaged homes and businesses. The recovery process is permeated by tension between the desire for speed and the need to take time to ensure responsible rebuilding.

Slide 7. Task structure

Each task in the exercise is organized the same way.

Introduction. Each task is introduced with a slide presentation with background information to help you with the task. The slides show how the task has been handled by communities after real hurricanes. Most introductions take about 5 minutes.

Instructions. Your packet contains one-page instruction sheets telling you the steps to take to complete each task. You will want to take time to read the instructions before you start work.

Handouts. For some tasks you will find handouts in your packet consisting of forms to be filled out during the task.

Products. You will produce something in every task. Products consist of information added to the map and entries on handouts.

Slide 8. What players need

You do not need to be a recovery expert to do these tasks. You need working knowledge of your community and some idea of the impacts of hurricanes. You have here a collection of background documents and maps to help you with the tasks. You can refer to these items throughout the exercise as questions arise. You also have a base map covering the community. You will be recording information on this map throughout the exercise. To do this you have a set of colored pens. *Handout 2* tells you which color to use for each category of information to be mapped.

Slide 9. Getting started

Before you start the exercise, you need to organize to do the work. First, you need to select a player to take the lead on each task. The selections can be recorded on *Handout 3* in your packet. The task leader will be responsible for keeping the discussion on track and helping the group reach some decisions before the timer goes off. We will also ask the leader to give a two-minute (or less) summary of the results at the end of each task, focusing on any problems encountered and recommended actions to overcome them.

You also need to select a player to be group recorder. This should be someone whose position on the city staff is not central to the topics covered in the exercise. For example, the planning director or building official would not be a good choice, but the city clerk or personnel director might be. This person will fill out the handouts with particular attention to *Handout 4. Recommended Actions* which is filled out at the end of each task. If available, a flip chart or a blackboard may be used along with *Handout 4*. The recorder will then recap the recommended actions listed on *Handout 4* as part of Task L.

In addition, you may want to select the artist among you to draw on the map.

Now, open your packet and take a minute to look over the four handouts. Then, go right to selecting the players to fill the various roles. We will start the introduction to Task A as soon as you have made your selections.

Handout 1

EXERCISE SCHEDULE

		Minutes
8:00 - 8:30	Introductions/Explanations	30
8:30 - 9:10	Task A. Warning and Evacuation	40
9:10 - 9:30	Task B. Emergency Shelter	20
9:30 - 10:30	Task C. Damage Scenario	60
10:30-10:50	*Break*	*20*
10:50-11:10	Task D. Managing Debris	20
11:10-11:30	Task E. Restoring Services	20
11:30-12:00	Task F. Damage Assessment	30
12:00 - 1:00	*Lunch*	*60*
1:00 - 1:20	Task G. Temporary Business Sites	20
1:20 - 1:40	Task H. Temporary Housing	20
1:40 - 2:25	Task I. Policies for Damaged Buildings	45
2:25 - 2:45	Task J. Permit Processing	20
2:45 - 3:05	*Break*	*20*
3:05 - 4:20	Task K. Reconstruction Planning	75
4:20 - 5:00	Task L. Mitigating Hurricane Hazards	40

Handout 2

COLOR KEY FOR MAPPING INFORMATION

COLOR	INFORMATION ON MAP
Blue	• V-Zone, A-Zone • parcels with buildings damaged 50% or more
Brown	• breached or overtopped seawall • areas with concentrations of pre-FIRM buildings • temporary business sites
Green	• areas evacuated • evacuation routes • emergency shelters
Yellow	• limits of storm surge and freshwater flooding • mobile home parks • temporary housing
Orange	• areas of shoreline erosion • areas with concentrated wind damage • historic buildings
Purple	• debris clearance areas and roads • debris disposal sites
Red	• major facilities (marinas, schools, hospitals, government buildings etc.) • washed out bridges and roads • areas without access
Black	• damaged utilities • areas now in V-Zone due to erosion

Handout 3

TASK LEADERS AND OTHER ASSIGNMENTS

TASKS	LEADERS
Task A. Warning and Evacuation	
Task B. Emergency Shelter	
Task C. Damage Scenario	
Task D. Managing Debris	
Task E. Restoring Services	
Task F. Damage Assessment	
Task G. Temporary Business Sites	
Task H. Temporary Housing	
Task I. Policies for Damaged Buildings	
Task J. Permit Processing	
Task K. Reconstruction Planning	
Task L. Mitigating Hurricane Hazards	

Mapper: _____

Group Recorder:_____

Handout 4. RECOMMENDED ACTIONS

TASKS	ACTIONS	Priority
Task A Warning and Evacuation		
Task B Emergency Shelter		
Task C Damage Scenario		
Task D Managing Debris		
Task E Restoring Services		
Task F Damage Assessment		
Task G Temporary Business Sites		
Task H Temporary Housing		
Task I Policies for Damaged Buildings		
Task J Permit Processing		
Task K Reconstruction Planning		

SCRIPT -- TASK A. WARNING AND EVACUATION
(You have 10 minutes to read the script.)

Slide A1. Task A. Warning and Evacuation

Most hurricanes arrive with some warning. A well-prepared response to a hurricane warning can save lives and prevent property damage. In Task A you will decide how to respond to a warning that Hurricane Gail is heading directly for _____ (community) and expected to make landfall in about 24 hours. The warning describes Gail as a Category 3 hurricane with 120 mph winds and a 10 foot storm surge.

Slide A2. Space shuttle photo of Hurricane Elena, 1985

This is Hurricane Elena as seen from the space shuttle *Discovery* in September 1985. The National Weather Service designates June 1 to November 30 as hurricane season. During this period, tropical depressions form and can evolve into tropical storms and sometimes into hurricanes. A tropical depression becomes a tropical storm when sustained wind speeds reach 40 mph and a tropical storm becomes a hurricane or typhoon when wind speeds reach 74 mph. When a tropical depression becomes a tropical storm, the Weather Service assigns it a name in alphabetical order. In 1995, 19 named storms arose in the Atlantic Ocean. Until 1979, only female names were used, but in the interests of equal opportunity, half of the names are now male.

Slide A3. Saffir-Simpson hurricane scale

Hurricanes are categorized primarily by wind speed according to the Saffir-Simpson Scale, shown here. There are 5 categories of hurricanes increasing in strength from 1 to 5. A Category 1 hurricane has winds between 74 and 95 miles per hour with a storm surge adding 4 to 5 feet to the normal height of a tide. Category 5 has winds over 155 miles per hour with a storm surge higher than 18 feet.

Slide A4. Tropical storm tracks, 1995 season

This shows the paths of all the 1995 tropical storm systems in the Atlantic Ocean. Using satellite images and airplane flights into the storm's eye, the National Weather Service and the Tropical Prediction Center (formerly called the National Hurricane Center) in Florida track storms to warn of approaching tropical storms and hurricanes. Forecasters monitor wind speed, air pressure, the size of an approaching storm, its speed of approach, and the path it is taking to determine whether or not to issue a watch or warning and what areas to alert.

Slide A5. Weather report

You get the Weather Service reports in your local newspaper, on TV and radio, or perhaps on a NOAA Weather Radio. If your area is threatened, the county emergency response organization will be contacted directly either by the Weather Service or the state emergency management organization.

Slide A6. Hurricane watches and warnings

When the Weather Service contacts emergency managers, it issues one of four official alerts--a tropical storm watch, tropical storm warning, hurricane watch, and hurricane warning. A hurricane watch is an announcement for specific areas that a hurricane or hurricane conditions pose a threat to a coastal area, generally within 36 hours. A hurricane warning is an alert that a hurricane is expected in a specified coastal area within 24 hours. When a hurricane warning is issued, all precautions should be taken immediately.

Slide A7. Map of Florida showing areas alerted for Hurricane Erin, August 1995

If the hurricane's path is unusual or erratic, the warning may be issued only a few hours before the beginning of hurricane conditions. This map shows the areas of the Florida coast under alert on August 1, 1995 as Hurricane Erin approached. As you can see, the southeast coast was under a hurricane warning; the southwest coast under a hurricane watch, and the east central coast under a tropical storm warning. About 660,000 residents and visitors were ordered to evacuate the southeast coast. The next day, Erin, downgraded to a tropical storm, abruptly shifted course to the north and crossed over central Florida entering the Gulf of Mexico north of Tampa. It strengthened to a hurricane again over the Gulf of Mexico, and on August 3, struck Pensacola in the Florida panhandle with less than 24 hours warning. Meteorologists have sophisticated tools to track hurricanes, but still struggle to predict what a hurricane will do next.

Slide A8. Local emergency manager

Someone in your local government is designated to receive notice of a hurricane warning and take appropriate actions. It may be the city manager, the police chief, or your local emergency manager. When this person receives a warning, his or her first task is to warn people who may be in danger. They need to know what to expect, when, and what actions to take.

Slide A9. NFIP map for the Island of Kauai

Warnings are more useful if you have identified the areas subject to damage from a storm surge--usually low-lying areas along the shore. Under the National Flood Insurance Program, FEMA provides flood-prone communities with maps showing designated flood hazard areas. The most commonly used maps are called Flood Insurance Rate Maps or FIRM's. This slide shows a FIRM for the Island of Kauai. The A-Zone is the flood hazard area and the V-Zone is the part of the flood hazard area along the coast that is subject to high-velocity waves higher than 3 feet. The "E"s indicate locations where flood elevations have been calculated.

Slide A10. Evacuation map, Sarasota, Florida

FEMA funds the National Weather Service and the U.S. Army Corps of Engineers to operate a computer model called SLOSH, an acronym for Sea, Lake, and Overland Surge from Hurricanes. Data for different categories of storms are entered into SLOSH and storm surge levels for each category are determined and then used to produce evacuation maps like this one for Sarasota, Florida. Each zone is color coded to distinguish priorities for evacuation. The purple zone, closest to the Gulf of Mexico, would be evacuated first. The others would be evacuated in order depending on the expected height of the storm surge. Local officials must evaluate the information they receive about the severity of an approaching hurricane and decide what areas to evacuate. In all hurricane warnings, mobile homes must be evacuated because of their extreme vulnerability to both wind and wave damage.

Slide A11. Cars evacuating before Hurricane Opal, 1995

When a hurricane is expected, it is very important to direct traffic to high and dry roads. It is easy to mistake both the depth and velocity of water on a road. Routes for evacuation need to be designated and traffic flow managed to accomplish a timely and orderly evacuation. You might turn arterials leading from the coast into one-way streets and stop collecting bridge tolls. People need to know safe routes to take and where they can go until the emergency has passed. This shows evacuation from Hurricane Opal in 1995. Had the storm not diminished, officials estimate thousands of these people would not have made it to safety. Using the reverse lanes for evacuation might have helped.

Slide A12. Evacuating people

People are often in danger in homes and businesses located in low-lying areas, but may be reluctant to leave. As Erin approached Escambia County, Florida, officials tried to induce reluctant people to evacuate by requiring them to sign forms holding the county harmless, "if I die as a result of my failure to evacuate." Communities need a plan for evacuation to avoid desperate, last-minute attempts to help people to safety. The plan should include how to assist the elderly, handicapped, tourists (with and without cars), and other people with special needs. You also need to consider security for evacuated properties.

Slide A13. Refuge of last resort

Sometimes time is too short to evacuate everyone. This is likely to be the case with communities on barrier islands or in other coastal locations with only one or two access roads. The access roads may be low and impassable because of high surf before the hurricane actually strikes. Research has been conducted to identify relatively safe structures, or rooms in structures, in potential evacuation zones as "refuge of last resort" for those who cannot evacuate in time. FEMA is working on designs for a "safe room" in residential buildings which could be used for such a refuge.

Slide A14. Grocery store windows boarded up prior to Hurricane Bertha, 1996

The first priority is always to ensure the safety of people, but with a hurricane warning, it is often possible to protect property from damage, too. This shows an ocean front grocery store boarded up as Hurricane Bertha approached North Carolina in 1996. The skies are still partly sunny, making it hard to take appropriate precautions. People can also move important records, furniture and other items to upper stories of buildings or to safe inland locations.

Slide A15. Now begin Task A.

Now turn to the instructions for Task A in your packet. Take time to read the steps before you begin. Please ask for help, if you need it. You have 30 minutes to decide how to respond to this morning's hurricane warning.

Reminder to Facilitator: Be sure to set the timer for 30 minutes.

INSTRUCTIONS -- TASK A. WARNING AND EVACUATION
(Time to complete the task: 30 minutes)

Purpose

Determine how you will respond to the hurricane warning.

Materials

- Base map of the community showing parcels, roads, bridges, major facilities, and topography, if available
- The most recent Flood Insurance Rate Maps (FIRM's) issued by the Federal Emergency Management Agency (FEMA) for the National Flood Insurance Program (NFIP)
- Local evacuation plans and information about storm surge runup areas
- *Handout A. Actions in Response to Hurricane Warning*

Steps

1. Transfer the boundaries of the A-Zone and V-Zone from your FIRM to the base map (**blue**).

2. Assume you have just received a warning that Hurricane Gail, a Category 3 storm with 120 mile per hour winds and a 10-foot storm surge, is expected to make landfall at your community within 24 hours. On the base map, outline the areas you will evacuate and number them 1, 2, 3, etc., in order of priority. Include coastal floodplains, mobile home parks, additional areas that are at risk of damage from flooding or high winds, and areas you think will lose access (**green**).

3. On the base map, outline the evacuation routes (**green**).

4. On *Handout A. Actions in Response to Hurricane Warning*, list the actions you will take to protect people and property.

5. How well prepared are you to respond to a hurricane warning? Discuss any problems you uncovered and on *Handout 4. Recommended Actions,* list actions you can take now to improve your warning and evacuation system.

Products

- Base map showing: 1) boundaries of the A-Zone and V-Zone, 2) areas evacuated, identified by priority, and 3) evacuation routes
- Completed *Handout A. Actions in Response to Hurricane Warning*
- Entries on *Handout 4. Recommended Actions*

Handout A

ACTIONS IN RESPONSE TO HURRICANE WARNING

Who receives a hurricane warning? Who has authority to order evacuation?

What plans do you have to warn and evacuate the elderly, hospitalized, handicapped, visitors to the area with and without cars, and other special populations?

What traffic management techniques will you use to increase the capacity of the evacuation routes and ensure that the highest priority zones are evacuated first?

How long will it take to evacuate the population at risk? Base your estimate on the number of people you need to evacuate and the capacity of the evacuation routes. Remember that you will be lucky to have 24 hours warning. Can you evacuate the vulnerable areas in this time?

Where will you send evacuated people?

What actions will you take to protect property from hurricane damage?

SCRIPT -- TASK B. EMERGENCY SHELTER
(You have 5 minutes to read the script.)

Slide B1. Task B. Emergency Shelter

Task B is to estimate shelter needs and identify safe buildings and locations for shelters. Emergency shelters address the immediate and pressing human needs for food, shelter, and care for people who have been evacuated from their homes.

Slide B2. Red Cross disaster services center tent

The American Red Cross is responsible under Congressional charter for setting up and managing emergency shelters. This shows a Red Cross disaster services tent. The Red Cross mobilizes quickly and is typically on the scene before a hurricane strikes.

Slide B3. Red Cross disaster services van at shelter in Topsail, North Carolina, 1996

Here you see an emergency shelter at the Topsail middle and high schools after Hurricane Bertha in 1996. Public shelter locations are usually predetermined; schools, churches, armories, and other public buildings can be used, but schools are the most common. If shelter costs are to be reimbursed by FEMA, Red Cross must approve shelter sites before they are opened. According to the Red Cross, about 25% of the people displaced by any disaster stay at a public shelter. The rest find shelter with family or friends or go to hotels or motels.

Slide B4. Shelter site map, Manatee County, Florida

It is important to select shelter sites that are safe from the storm surge, wind damage, inland flooding, and other hazards. The little red houses on this map show Red Cross shelter sites in Manatee County, Florida. Many coastal communities, particularly those on barrier islands, do not have safe shelter sites. Coordination with other jurisdictions is required to designate and open shelters outside the community.

Slide B5. Now begin Task B.

Now turn to the instructions for Task B. You have 15 minutes to define the need for emergency shelters and decide which ones to open.

Reminder to Facilitator: Be sure to set the timer for 15 minutes.

INSTRUCTIONS -- TASK B. EMERGENCY SHELTER
(Time to complete the task: 15 minutes)

Purpose

Determine emergency shelter needs and how to meet them.

Materials

- Base map with information from Task A
- Emergency response plan

Steps

1. Take your estimate of the number of people evacuated from *Handout A. Actions in Response to Hurricane Warning*, and, from the information provided in the script and your knowledge of your community, decide what percentage of the evacuees will need emergency shelter. Remember that, on the average, about 25% of people displaced by a disaster seek public shelter. Then, calculate the number of people needing emergency shelter and enter the number below.

   Number of people needing emergency shelter: _____

2. Decide which shelters need to be opened, making sure that the shelter sites are accessible, safe from storm surge, high winds, and freshwater flooding. Outline the selected sites in your community on the base map (**green**). List below shelter locations outside the community that will be needed and what contacts you need to make to be sure they are opened.

   Shelter locations outside the community: _____

   _____

   Contacts: _____

3. Discuss any problems you identified in your planning for emergency shelter, and on *Handout 4. Recommended Actions,* list actions you can take now to improve your ability to shelter evacuated people.

Products

- Base map showing location of emergency shelters you have opened in your community and list of shelters outside your community
- Entries on *Handout 4. Recommended Actions*

SCRIPT -- TASK C. DAMAGE SCENARIO
(You have 15 minutes to read the script.)

Slide C1. Task C. Damage Scenario

The hurricane warning proved accurate. Hurricane Gail has struck _____ (community) head on. As forecast, it is a Category 3 hurricane with a storm surge of at least 10 feet and wind speeds over 120 miles per hour. Destruction is heavy from the storm surge and the wind. A seawall or other coastal protective structure is destroyed, beach erosion is severe, and backwater surges and flooding of coastal streams cause additional damage. Flying debris damages many structures and debris from trees and structures is everywhere. Bridges and low roads are washed away and most of the community is without water and power.

The rest of this script is about the damaging effects of hurricanes and the areas and buildings most vulnerable to damage. This is to help you decide how a large hurricane would impact your community and where the damage will be located.

Slide C2. Coastal houses, Folly Beach, South Carolina

Scenic beauty, recreation, fishing, and shipping draw people to coasts like this in Folly Beach, South Carolina. Fifty percent of the U. S. population lives within an hour's drive of a seashore. Twenty-three of the fifty states and all the U.S. territories have coastlines on the Atlantic or Pacific oceans, the Caribbean Sea, or the Gulf of Mexico.

Slide C3. Same scene after Hurricane Hugo in 1989

Here is the same stretch of Folly Beach after Hurricane Hugo in 1989. The houses shown in the previous slide are now a pile of rubble. Hurricanes are recurrent visitors to U.S. coasts from Maine to Texas, the state of Hawaii, the Commonwealth of Puerto Rico, and Territory of the Virgin Islands. Hurricanes in the western Pacific are called typhoons. The Pacific Trust territories experience damaging typhoons. The U.S. mainland has been hit by a hurricane in all but 18 years this century.

Slide C4. Pacific coast storm, 1983

This shows a coastal storm in Santa Cruz County, California in the winter of 1983. States on the Pacific coast also suffer severe storms and damage from storm surges. Nor'easters can cause similar damage along the Atlantic coast. Coastlines are also subject to damage from tsunamis. Tsunamis, generated by large undersea earthquakes, are huge sea waves that can speed across oceans striking distant shores. The 1964 earthquake in Alaska generated a tsunami which damaged the waterfront in Crescent City, California and also struck the coast of Chile. Wave damage from coastal storms and tsunamis can be like that from hurricanes.

Slide C5. Hurricane hazards

Hurricanes come with storm surges, high winds, and heavy rains. As shown on this slide, each of these causes damage. Hurricanes also can spawn tornadoes which can become disastrous in their own right. Because the formation and path of tornadoes is essentially unpredictable, this significant hazard is not further considered in this exercise. Let's look in turn at each of the hazards listed on the slide.

Slide C6. Diagram of storm surge

This diagram shows a storm surge. Storm surges cause most hurricane deaths, injuries, and property damage. A storm surge is a relatively slow rise in water surface elevation caused by high winds pushing and piling water on top of normal sea level. The surge is highest in front and north of the storm and in shallow water along the shore. The increase in water level can amount to 15 or more feet and is higher if the storm surge coincides with high tide. Much Atlantic and Gulf coast development is less than 10 feet above mean sea level and, thus, is vulnerable to flooding from storm surges. In addition, storm waves, 5 to 10 feet high, ride on top of the surge. The wave impact can destroy seawalls, piers, buildings, roads, and utility lines. As a shore-front structure breaks apart from wave impact, the debris is carried by the waves and thrown against the next structure landward, causing additional damage in a domino-like sequence. Storm surges and associated waves are a risk in low-lying coastal areas.

Slide C7. Damage from storm surge, Panama City, Florida, 1995

This shows a motel in Panama City, Florida following Hurricane Opal. Erosion from a storm surge has removed the sand from under this building causing the deck and bottom floor to drop. Storm surges are the primary cause of beach and cliff erosion. Storm surges can change the shape of the shoreline. A single storm can remove entire systems of beaches and dunes, carrying the sand offshore or washing it inland. They can wash over barrier islands, cutting new channels and filling old ones. Valuable beach front lots can disappear and inland lots can become ocean front property overnight. Huge sections of ocean front bluffs can fall away. Beaches, cliffs, and barrier islands with ongoing erosion problems are the most likely to erode severely in a hurricane.

Slide C8. Damage from high winds in Hurricane Andrew, 1992

Sustained wind speeds in a hurricane often exceed 100 miles per hour and gusts can be much stronger. High winds pick out the weak points in buildings. An entire structure can literally explode from a single small breach, such as a broken window. As shown in this slide taken after Hurricane Andrew, wind damage can vary depending on construction characteristics. Wind stripped the shingles from roofs in the subdivision in the center of the slide. In the foreground, you see a mobile home park that was completely destroyed. Winds are usually, but not always, highest at the point of landfall and gradually diminish as the storm moves inland.

Slide C9. Damage from flying debris, Hurricane Frederic, 1979

This shows an "airborne guillotine" in Hurricane Frederic which struck Mobile, Alabama in 1979. High winds strip branches from trees and parts from structures and carry them aloft. Sometimes the wind picks up outdoor furniture or play equipment; virtually anything not nailed down can become airborne. The wind flings the airborne debris against other trees and structures, causing more damage and more debris. Flying objects snap power lines, puncture walls and roofs, block roads, and generally create a massive cleanup problem. Areas with the highest winds are the most dangerous.

Slide C10. Freshwater flooding from heavy rains, Baytown, Texas

Hurricanes almost always bring heavy rains--10 inches or more can fall during the course of a storm. Intense rainfall combined with storm surge often causes flooding along the coast. This shows flooding in Baytown, Texas from Hurricane Alicia in 1983. Flooding can be particularly dangerous when high flows in the streams coincide with storm surges and/or high tides. Vulnerable areas are deltas and inlets where streams empty into the ocean and the floodplain of streams and rivers. Low-lying areas and areas with drainage problems under normal circumstances may flood because of heavy runoff or because debris clogs drains and channels.

Slide C11. Rain-soaked building interior

Heavy rains can also add water damage to wind damage in buildings with damaged roofs or walls. This shows an apartment building stripped of its wall by Hurricane Andrew. Daily afternoon thunderstorms continued to damage the building's contents as owners found it difficult to get materials and help to close up the holes.

Slide C12. Factors affecting hurricane damage

Where we build and how we manage both construction and landscaping determines the amount and kind of damage that is likely to occur from a given hurricane. The slide lists the critical factors. They are: location of structures, integrity of shoreline protection structures, quality of design and construction, and plants used in landscaping. We'll look at each of these factors in turn.

Slide C13. Building in coastal floodplain

The areas most prone to hurricane damage are those closest to the shore, particularly areas with low elevations and next to the mouths of streams and rivers. Here you see a building located right on the beach in Nags Head, North Carolina. Buildings in the coastal floodplain, as shown on your Flood Insurance Rate Map, are more at risk than buildings outside this zone. But buildings outside the floodplain may also be damaged by storm surges higher than anticipated and by wave-borne and airborne debris from destroyed structures in the floodplain.

Slide C14. Damaged seawall

The integrity of shore protection structures is also a critical damage factor. This shows a damaged seawall no longer protecting a high-rise building at Surfside Beach, South Carolina after Hurricane Hugo in 1989. Damage can be very severe when structures designed to hold back the sea fail or are overtopped by waves larger than they were designed to handle. The FIRM's are drawn assuming that shore protection structures will work as intended. This is not always the case. Much damage in hurricanes comes from the failure of groins, seawalls, and other structures designed to protect the shoreline.

Slide C15. Pre-FIRM building near coast

The quality of building design and construction are also important factors in hurricane damage. Under the NFIP, buildings in the V-Zone must be elevated on pilings to reduce the chance of wave damage. Buildings in the A-Zone must be elevated, if residential, and elevated or floodproofed, if commercial. Buildings constructed before these regulations went into effect, called Pre-FIRM buildings, are more vulnerable to wave damage than buildings constructed afterwards.

Slide C16. Schematic of house connections creating a continuous load path

As noted before, wind unerringly finds the weak point in buildings. Good construction is the key to wind resistance. This means strong connections to create a continuous load path between roof and walls and between walls and the foundation. Model building codes provide for wind-resistant construction and are upgraded based on experience after major hurricanes. However, communities can adopt current codes and still suffer wind damage because so many buildings were constructed before codes were adopted and because construction is not always done according to the code. Older buildings and buildings constructed without adequate inspection, for whatever reason, are particularly vulnerable to hurricane wind damage.

Slide C17. Damaged mobile homes, Hurricane Andrew, 1992

Mobile homes are easily damaged by winds, waves, and flooding. Water-borne and airborne debris from damaged mobile homes often causes damage to other buildings. This shows mobile homes destroyed in Hurricane Andrew.

Slide C18. Poor architectural design, Hurricane Iniki, Hawaii, 1992

Architectural features also affect vulnerability to hurricane damage. In Hurricane Iniki houses like the one shown here with discontinuous rooflines were badly damaged. Other design features such as gabled roof ends can also contribute to hurricane damage.

Slide C19. Damaged Ben Sawyer Bridge, Hurricane Hugo, 1989

This is, or was, the Ben Sawyer bridge connecting Sullivans Island and Isle of Palms to the mainland of South Carolina. Hurricane Hugo in 1989 blew the bridge down. Low-lying roads and bridges may also be washed out by storm surges or left so clogged with debris, sand, and mud they are unpassable. For people living or working on barrier islands, the loss of a bridge leaves them with only boat access to their homes and businesses.

Slide C20. Downed power lines, Hurricane Hugo, 1989

Minor storms can disrupt utility services and hurricanes always cause major utility problems. Downed power and telephone lines, as shown here, are almost universal. Uprooted trees can also destroy underground utility lines. Water supplies are often lost or contaminated and waste treatment plants may not operate. Damage to utilities depends on their location and how well they are designed and constructed to withstand wind and water damage.

Slide C21. Palm trees that survived Hurricane Iniki, 1992

Landscaping is important, too. This shows palm trees, ratty, but still standing after Hurricane Iniki destroyed the nearby houses at Poipu Beach on Kauai. In general, native landscaping materials do better in hurricanes. Non-native plants tend to uproot, break, or lose major branches in hurricane-force winds. Such trees are a hazard to people and the surrounding buildings.

Slide C22. Hazardous material problem

Hurricanes and hazardous materials don't mix well. This shows the Hess Oil Refinery on St. Croix after Hurricane Hugo. This situation at St. Croix was further complicated when airborne oil droplets contaminated local water supplies. Spilled hazardous materials can explode, generate toxic clouds, contaminate water and land and, in general, greatly complicate both emergency response and long-term recovery. Vulnerability is high where hazardous materials, including propane and home heating oil, are used or stored. Areas near potential spill sites, particularly downwind and downstream are also vulnerable.

Slide C23. Now begin Task C.

Now it's time to begin Task C and create your own hurricane damage scenario. You have 45 minutes to complete this task.

Reminder to Facilitator: Be sure to set the timer for 45 minutes.

INSTRUCTIONS -- TASK C. DAMAGE SCENARIO
(Time to complete the task: 45 minutes)

Purpose

Identify the significant impacts of Hurricane Gail, using judgment and the best information available to you.

Materials

- Base map showing information from Tasks A and B
- Information on the effects of previous hurricanes in your community

Steps

1. On the base map, mark at least one shoreline protective structure damaged or overtopped by the storm surge (**brown**) and draw the boundaries of the areas actually flooded by the storm surge and freshwater flooding including all of the V-Zone, all or part of the A-Zone, and an additional area impacted because of the failed seawall (**yellow**).

2. Outline hurricane damage on the base map as follows:
   a) areas of severe shoreline erosion (**orange**)
   b) areas in the flooded area with concentrations of pre-FIRM buildings (**brown**)
   c) areas outside the flooded areas with concentrated wind damage because of inadequate design, construction, or inspection (**orange**)
   d) mobile home parks (**yellow**)
   e) major public facilities, such as ports, fishing wharves, marinas, hospitals, schools, emergency operations centers, police and fire stations, and other government buildings that have at least temporarily lost access or function (**red**)
   f) bridges, roads, and other transportation facilities which have been washed out or blocked by debris or sand (**red**)
   g) utilities including water and sewage treatment facilities and power substations damaged in the storm (**black**)

3. Could any of this damage have been avoided? On *Handout 4. Recommended Actions*, list actions you can take now to avert damage in future hurricanes.

Products

- Base map showing the major impacts of the hurricane
- Entries on *Handout 4. Recommended Actions*

SCRIPT -- TASK D. MANAGING DEBRIS
(You have 5 minutes to read the script.)

Slide D1. Task D. Managing Debris

In Task D you decide how to clear, remove, and dispose of the debris left in the wake of Hurricane Gail.

Slide D2. Initial clearance

Debris can prevent emergency workers and search and rescue crews from reaching hard hit areas. Here you see debris being bulldozed from a residential neighborhood after Hurricane Andrew. Until debris is cleared, emergency work is hampered, utility damage cannot be repaired, and evacuated people cannot safely return to their homes and businesses. Help may be available immediately from the National Guard, Army Corps of Engineers, and volunteer organizations.

Slide D3. Debris pushed to side of the road after Hurricane Andrew

The initial clearance simply shoves the debris out of the way to provide access. After Hurricane Andrew, debris was moved to the side of the streets as shown here. Without good planning debris sometimes has to be moved more than once. Sometimes, the utility companies move it back to the center of the street to reach utility poles and lines lying on the ground. If streets are wide enough, it makes sense to pile debris in the center allowing traffic on either side. This way the debris does not block access to utilities, sidewalks, and buildings.

Slide D4. Trucks removing debris

Once search and rescue operations are over, you can begin to remove the debris from the damaged areas. Here you see trucks removing debris after Hurricane Andrew. Usually you need to identify debris clearance areas and establish priorities for clearance. For example, you might decide to clear access and space around public buildings first; then clear the commercial areas, and lastly, the residential areas. You will probably have to remove debris from each area more than once. As people clean up individual properties, make repairs and rebuild, more debris is generated. After Andrew, debris clearance continued for more than a year and cost more than $500 million--more than any other recovery task.

Slide D5. Debris site after Hurricane Andrew

This shows a debris site used after Hurricane Andrew. Hurricane debris is typically either burned or dumped in a landfill. In either case, property owners are usually required to sort debris and deposit it at curbside for pickup. Public agencies rarely enter private property for pick up because of potential liability. Hazardous materials, such as asbestos, need to be separated for special handling. Materials that can be burned need to be separated from those that can't. Plant materials are sometimes separated for composting. Many materials can be salvaged or recycled and these, too, are best separated at curbside. After Hurricane Marilyn in 1995, all the galvanized metal from damaged roofs in St. Thomas was recycled.

Slide D6. Debris burn site

Finding suitable sites to burn hurricane debris is usually a public agency responsibility. Here you see debris burning after Hurricane Andrew in south Dade County. Sites for burning need to be selected with attention to fire safety, air quality, and nearby land uses. Many states require permits and environmental clearance for burn sites. Such sites need to be separated and screened from other urban uses but readily accessible by truck. You also need to identify appropriate landfills for debris that can't be salvaged, recycled, or burned.

Slide D7. Now begin Task D.

Now, turn to the instructions for Task D. You have 15 minutes to complete this task.

Reminder to Facilitator: Be sure to set the timer for 15 minutes.

INSTRUCTIONS -- TASK D. MANAGING DEBRIS
(Time to complete the task: 15 minutes)

Purpose

Clear, remove, and dispose of the debris left by Hurricane Gail.

Materials

- Base map with information from Tasks A-C

Steps

1. Review the damage information on the base map, identify areas and roads to be cleared (**purple**) and number each area and road 1, 2, 3 . . . according to its priority for clearance.

2. Note below how you plan to remove and dispose of the debris considering options for salvaging, recycling, burning, and dumping.

   _____

   _____

   _____

   _____

3. On the base map, identify burn sites and available landfills for debris disposal (**purple**).

4. What problems managing debris do you foresee? Could any be averted by planning ahead? On *Handout 4. Recommended Actions,* list actions that might be taken now to avoid the problems identified.

Products

- Base map showing areas and roads to be cleared by priority and disposal sites
- Notes about how to manage debris
- Entries on *Handout 4. Recommended Actions*

SCRIPT -- TASK E. RESTORING SERVICES
(You have 5 minutes to read the script.)

Slide E1. Task E. Restoring Services

The ability to deliver essential services to people is often destroyed by a hurricane. Quick restoration is necessary to protect public health and safety. Task E is to identify areas without services and determine how to restore services quickly.

Slide E2. Washed out and sand covered road after Hurricane Opal, 1995

Bridges and roads washed out or clogged with debris or sand slow emergency response and threaten the functioning of the community. This shows a washed out and sand covered road in the panhandle of Florida after Hurricane Opal. Missing bridges and roads can impair access to entire communities. Quick, temporary solutions are often needed, such as ferry boats, temporary bridges, or rapidly graded detours. Devising solutions is a high-priority responsibility of public agencies after a hurricane.

Slide E3. Damaged traffic signal, Hurricane Andrew

The loss of traffic signals and road signs creates almost as big a barrier to access as the loss of a bridge or road. Dade County lost 2,200 traffic lights in Hurricane Andrew. People could not find their way around and traffic became hopelessly snarled. Temporary signs and many traffic cops--regular and volunteer--were needed until repairs and replacements were done. In heavily damaged areas, colored balloons were used to let people know the locations of feeding stations, shelters, and churches.

Slide E4. Downed utility poles, Hurricane Iniki

Power and telephone lines are particularly vulnerable to hurricane damage. Downed lines and poles not only mean disruption of service but menace the safety of rescue workers and others in the damaged areas. After Hurricane Andrew, more people were killed by electrocution cleaning up after the storm than during the storm. Responsibility for removing safety hazards and restoring power and telephone service usually rests with the utility companies, but local governments play a critical role in helping establish priorities, removing debris for the repair work, and restricting access to the work areas.

Slide E5. Work on power lines

After a hurricane, communities often try to get utility companies to underground the utility lines to remove eyesores and prevent loss of service from high winds. However, power can be much more quickly restored by stringing lines from pole to pole than by digging trenches for conduits. Most utilities will not consider undergrounding after a disaster unless a community has adopted a program to accomplish this before a hurricane strikes.

Slide E6. People filling water jugs, Charleston, South Carolina after Hurricane Hugo

The loss of water supplies and water treatment requires immediate public action to provide safe water for drinking and sanitation. After Hurricane Hugo, water mains in many parts of Charleston, South Carolina were severed. This shows people lining up with bottles to get water at a public fountain.

Slide E7. Map showing location of town hall, Nags Head, North Carolina

This shows the location of town hall in Nags Head, North Carolina located in the coastal floodplain. In the event of a hurricane, this building, containing the EOC, would probably not be usable. Quick restoration or relocation is a high priority when community facilities are damaged in a hurricane. Recovery depends on the continued operation of facilities such as hospitals, schools, fire stations, and municipal offices.

Slide E8. Now begin Task E.

You have 15 minutes to decide how to handle service disruptions caused by Hurricane Gail.

Reminder to Facilitator: Be sure to set the timer for 15 minutes.

INSTRUCTIONS -- TASK E. RESTORING SERVICES
(Time to complete the task: 15 minutes)

Purpose

Make plans to temporarily restore essential utilities and public services until permanent repairs to facilities damaged in Hurricane Gail are completed.

Materials

- Base map with information from Tasks A-D

Steps

1. On the base map, review the information you have added showing damaged roads, bridges, utilities, and public facilities. Outline areas that would lose access (**red**).

2. In the space provided below, note the key actions you will take to restore access, utilities services, and public services until permanent repairs can be completed.

   _____

   _____

   _____

   _____

   _____

3. What problems do you foresee in restoring access, vital utilities and public services to the community? *On Handout 4. Recommended Actions,* list actions that might be taken now to avoid the problems identified.

Products

- Base map marked to show areas with disrupted access
- List of actions to restore access, essential utilities, and public services
- Entries on *Handout 4. Recommended Actions*

SCRIPT -- TASK F. DAMAGE ASSESSMENT
(You have 5 minutes to read the script.)

Slide F1. Task F. Damage Assessment

Task F is to assess the hurricane damage. This task fine tunes the damage scenario completed in Task C, looking beyond areas to individual buildings. After a real hurricane, your state emergency management office will want detailed damage assessments of damaged facilities to determine what disaster assistance your jurisdiction may need. You also need this information to determine needs for recovery and rebuilding.

Slide F2. Training of inspectors by FEMA contractor

Damage assessment requires inspecting individual structures. Few communities have sufficient staff at hand to complete this task without outside help. Inspectors from public agencies or consulting firms in other regions or states are often brought in to help as volunteers or contractual personnel. Here you see a FEMA contractor training local building officials in the U.S. Virgin Islands to assess hurricane damage.

Slide F3. Building with red tag

The assessment of individual structures results in the tagging of all inspected buildings, usually with a red, yellow, or green placard. Here you see a red tag on a building in North Carolina damaged by Hurricane Fran. This means "unsafe, do not enter or occupy." A yellow tag means "restricted entry," and a green tag means "inspected, no restriction on use or occupancy." When in doubt, it is wise to use a red tag. It can be changed later to yellow or green based on more careful evaluation.

Slide F4. Classifying damage to buildings

This lists information you need to collect about each hurricane-damaged building: its use or occupancy, location in or out of the V-Zone and A-Zone, percent damage, and historic status. Use and occupancy are important so you can anticipate the recovery needs of displaced residents, businesses, and public services. Also, building use is important because the flood insurance program has different requirements for residential structures than for commercial buildings. Let's look at the reasons for the other items on the list.

Slide F5. Building in the V-Zone

You need to know if damaged buildings are in the V-Zone or A-Zone because different minimum standards for repairs and rebuilding apply under the NFIP and your community's floodplain management ordinance. This is a house in the V-Zone that survived Hurricane Alicia in Texas in 1983. Damage is limited to the loss of breakaway walls and site erosion, because the house was elevated and constructed to meet strict requirements pertaining to the V-Zone.

Slide F6. Building with more than 50% damage

Here is a damaged house in the coastal floodplain with damage obviously exceeding 50% of its market value. Under FEMA's minimum requirements for local floodplain management ordinances, buildings damaged 50% or more can be repaired only if they are brought up to full code compliance including elevation. In V-Zones, the lowest horizontal member must be at or above the Base Flood Elevation (BFE) and waves must be able to pass unobstructed between the living area and the ground. In A-Zones, buildings may be elevated on fill or foundation walls and the lowest finished floor must be at or above the BFE.

Slide F7. Categories for percent damage

Many communities use three categories in assessing percent damage, as shown here--up to 40%, 40% to 60%, and more than 60%. The middle group (40%-60%) brackets the buildings which might have 50% or more damage. Making this determination is strictly a local responsibility under the National Flood Insurance Program. Often the community assessor and real estate appraisers are needed to assist with this difficult and politically sensitive task.

Slide F8. Damaged church in Charleston, South Carolina

This shows an historic church in Charleston, South Carolina, damaged by Hurricane Hugo in 1989. Both federal and state regulations establish procedures which must be followed if historic buildings are to be demolished or modified during repairs. So, it is important to identify historic buildings in the damage assessment.

Slide F9. GPS system used in Dade County after Hurricane Andrew

FEMA is beginning to apply a new "high-tech" way to assess damage quickly after a natural disaster. Using a global positioning system (GPS) giving latitude and longitude combined with digital photos, FEMA is able to accurately locate damaged areas and structures, as shown in this slide.

Slide F10. Now begin Task F.

Please turn to the instructions for Task F to conduct your own damage assessment. You will also find *Handout F*--a table to record the information. You have 25 minutes to complete this task.

Reminder to Facilitator: Be sure to set the timer for 25 minutes.

INSTRUCTIONS -- TASK F. DAMAGE ASSESSMENT
(Time to complete the task: 25 minutes)

Purpose

Determine the extent of damage and number of damaged buildings.

Materials

- Base map with information from Tasks A-E
- Existing land use map or land use plan
- Lists of historic buildings
- *Handout F. Damage Assessment*

Steps

1. Using information recorded on the base map and your knowledge of the community's building stock, fill out *Handout F. Damage Assessment* as follows:
   a) In column 1, enter your estimate of the total number of hurricane-damaged buildings in each land use category.
   b) In column 2, enter your estimate of the number of damaged buildings in each land use category that are located in the A-Zone.
   c) In column 3, enter your estimate of the number of damaged buildings in each land use category that are located in the V-Zone.
   d) In column 4, enter your estimate of the number of damaged buildings in each land use category damaged 50% or more of their pre-disaster market value. You may assume that all mobile homes and at least 10-15% of the buildings in the flood zones will have 50% or more damage. Buildings constructed before your community entered the NFIP are most vulnerable.
   e) In column 5, enter your estimate of the number of damaged historic buildings in each land use category.
   f) Estimate the number of building inspectors you will need to complete the damage assessment in 3 to 5 days. Enter the number on *Handout F*.

2. On the base map, outline parcels in the coastal floodplain with buildings damaged 50% or more (**blue**). Place an **orange "H"** on parcels with damaged historic buildings.

3. Could you be better prepared to assess damages after a hurricane? On *Handout 4. Recommended Actions*, list actions that might be taken now to make this task easier.

Products

- Base map showing buildings in the coastal floodplain damaged 50% or more and damaged historic buildings
- Completed *Handout F. Damage Assessment*
- Entries on *Handout 4. Recommended Actions*

Handout F

DAMAGE ASSESSMENT

	1 # Damaged buildings	**2** In A-Zone	**3** In V-Zone	**4** 50% + damage	**5** Historic
Residential					
Commercial					
Industrial					
Public					
Totals					

Number of building inspectors needed to complete assessment in 3-5 days: _____

SCRIPT -- TASK G. TEMPORARY BUSINESS SITES
(You have 5 minutes to read the script.)

Slide G1. Task G. Temporary Business Sites

In Task G, you will select facilities and sites for temporary business locations. Businesses that cannot open their doors soon after a hurricane usually fail, losing clients to competing businesses--often in other jurisdictions. Quickly providing a place where displaced businesses can set up shop can help prevent business failures and allow businesses to provide necessary goods and services to the community during recovery.

Slide G2. Damaged retail street, Isle of Palms, South Carolina

This shows a retail street in Isle of Palms damaged in Hurricane Hugo. Some damaged businesses will need new locations, while others will be able to clean up and reopen quickly, if only on the sidewalk. Local government can help this process by quickly removing debris so that commercial streets can be opened.

Slide G3. State Farm Insurance operating from a trailer after Hurricane Andrew

After hurricanes, both local and disaster-related businesses often operate out of trailers. This shows a trailer housing State Farm Insurance after Hurricane Andrew. Local governments need to select appropriate sites for such trailers. Sometimes a community has vacant commercial space or land that can be used temporarily for displaced businesses. Cities can work with local business associations and property owners to identify sites that might be used temporarily by displaced businesses.

Slide G4. Winn Dixie, chain grocery store

Here we see a parking lot being used for distribution of donated goods. The grocery store, Winn Dixie, is operating its business from the sidewalk in front of the store. Winn Dixie, as a regional chain store, will have the resources of its parent company to draw on to recover, but local businesses are basically left on their own to recover. Cities can help most by effectively managing overall recovery and working cooperatively with local businesses.

Slide G5. Criteria for temporary business locations

Good temporary business locations are vacant, accessible and safe from further damage from natural hazards. They should be close to the damaged commercial district to encourage retention of patrons. The facilities or sites should be readily provided with utilities and parking. If private property is used, it is best if it is planned and zoned for commercial uses.

Slide G6. Now begin Task G.

The instruction page for Task G tells you how to find temporary business locations. You have 15 minutes to complete the task.

Reminder to Facilitator: Be sure to set the timer for 15 minutes.

INSTRUCTIONS -- TASK G. TEMPORARY BUSINESS LOCATIONS
(Time to complete this task: 15 minutes)

Purpose

Provide sites and facilities for business operations until damaged commercial buildings can be repaired or replaced.

Materials

- *Handout F. Damage Assessment*
- Base map with information from Tasks A-F
- Community plan, redevelopment or downtown plan
- Zoning map

Steps

1. Assume that several small businesses have been damaged and the buildings cannot be immediately reoccupied after the hurricane. Select vacant buildings suitable as temporary business locations, if available. Also select suitable sites for temporary commercial structures. Look for vacant and available sites that are accessible and close to the pre-hurricane location of displaced businesses. The sites should have suitable zoning, utilities available, and plenty of parking. Outline the facilities and sites on the base map (**brown**).

2. Could the businesses in your community be better prepared to survive a hurricane? On *Handout 4. Recommended Actions,* list actions that the community might take now to improve post-hurricane business survival.

Products

- Base map showing buildings and sites selected for temporary business locations
- Entries on *Handout 4. Recommended Actions*

SCRIPT -- TASK H. TEMPORARY HOUSING
(You have 5 minutes to read the script)

Slide H1. Task H. Temporary Housing

In Task H, you estimate the need for temporary housing and identify resources, including sites for temporary housing, to meet the need. Temporary housing bridges the gap between the time emergency shelters close and people are able to find long-term housing. It is important to help keep that gap as short as possible for as many people as possible.

Slide H2. Roof repair underway after Hurricane Andrew

After a hurricane, the first step is to help as many people as possible return to their homes quickly. This means doing many of the things noted earlier--removing sand, mud, and debris from streets, providing access, and restoring utility services. Community efforts can help people get back into their homes. Here we see neighbors helping a resident repair holes in his roof.

Slide H3. Individual debris cleanup

Cleaning up can look like an impossible task. This woman seems overwhelmed by the prospect. In many cases, cleanup is all that is needed for a family to reoccupy an evacuated house or apartment. Local officials can help by providing information about how to dry and clean flooded wallboard, flooring, carpeting, appliances, and other household items and how to temporarily patch damaged windows, siding, and roofs.

Slide H4. Biltmore Hotel in Coral Gables used for city employees and families, 1992

Vacant apartments and hotel or motel rooms can serve as temporary housing for people who cannot move quickly back into their damaged residences. Housing vouchers are sometimes issued by HUD to help families rent this kind of temporary housing. This shows the historic Biltmore Hotel, owned by the City of Coral Gables, Florida at the time Hurricane Andrew hit. The city used the hotel to house its employees and their families after the hurricane. The employees were thus assured that the immediate needs of their families were met so they could devote themselves to the community's recovery.

Slide H5. Infrastructure being installed for trailer park

FEMA considers trailers a last resort and makes them available sparingly. But sometimes there is little alternative to creating a temporary housing development using trailers, RV's, prefab housing, or some other easily erected structures. This shows workers installing infrastructure for a FEMA trailer settlement after Hurricane Andrew. Once the infrastructure for housing is in place, such property typically continues to be used for similar housing after the temporary housing has been removed.

Slide H6. Tent city in Homestead, Florida after Hurricane Andrew, 1992

After catastrophic disasters, tents may be used for temporary living quarters. Here you see a tent city established in Homestead, Florida after Hurricane Andrew destroyed more than 250,000 housing units in south Florida. Generally, low-income households have the greatest and longest need for temporary housing.

Slide H7. Criteria for temporary housing sites

Good temporary housing sites are vacant, accessible, and safe. They can be easily provided with utilities. If possible, they should be close to public services and the former neighborhoods of those being housed. Available public land is often used giving public control over reuse of the property when housing is removed. If private land is used, it should be planned and zoned for housing.

Slide H8. Now begin Task H.

In the next 15 minutes, you are to estimate the need and select locations for temporary housing. Please turn to the instructions for Task H.

Reminder to Facilitator: Be sure to set the timer for 15 minutes.

INSTRUCTIONS -- TASK H. TEMPORARY HOUSING
(Time to complete the task: 15 minutes)

Purpose

Help people find housing after the emergency shelters have closed and before damaged housing is repaired or replaced.

Materials

- Number of people needing emergency shelter from Task B
- Base map with information from Tasks A-G
- *Handout F. Damage Assessment*
- Community plan and zoning map

Steps

1. Review *Handout F. Damage Assessment* and your estimate of shelter population from Task B. From this information and your general knowledge of the income, ethnicity, age, and special needs of the community's population, estimate the number of households needing temporary housing. Consider the special needs of community employees and their families. As a rule of thumb, you can assume that about 10 percent of the shelter population will need assistance with temporary housing (divide by average number of persons per household to get number of units).

2. Identify on the base map apartment buildings, hotels, and motels that were not damaged and are likely to have vacant units which could be used to meet part of the need for temporary housing (**yellow**).

3. Select sites with suitable infrastructure to be used for trailers or prefab housing, considering that the selected sites could continue to be used for housing after the need for temporary housing has passed. Outline the selected temporary housing sites on the base map (**yellow**).

4. Does your community have adequate housing programs now that could be used to aid hurricane victims? On *Handout 4. Recommended Actions*, list actions that the community might take now to help people bridge the gap between emergency shelters and permanent rehousing.

Products

- Base map showing sites selected for temporary housing
- Entries on *Handout 4. Recommended Actions*

SCRIPT -- TASK I. POLICIES FOR DAMAGED BUILDINGS
(You have 5 minutes to read this script.)

Slide I1. Task I. Policies for Damaged Buildings

In Task I you decide on policies for repair and reconstruction of damaged buildings. As a participant in the National Flood Insurance Program, your community has adopted a floodplain management ordinance specifying conditions for the repair and reconstruction of damaged buildings in the floodplain. Part of the task is to apply these policies to determine the fate of these buildings.

Slide I2. Damaged seawall

This damaged seawall was built to protect these multi-story buildings. Until decisions are made about rebuilding the wall and similar shore protection structures, property owners cannot make informed decisions about damaged buildings. You need to ask the policy question, "Is public money better spent relocating vulnerable buildings away from the shore or reconstructing seawalls?" In some cases, you may need to defer decisions about buildings until you decide about shore protection structures.

Slide I3. Options for hurricane-damaged buildings

This slide lists the three R's: a community's policy options for damaged buildings. Buildings may be removed through demolition or relocation leaving the site clear; repaired with or without improved construction or additional flood protection; or rebuilt on the same site meeting standards in the current building code and floodplain management ordinance. The choices depend on the amount of damage, the location of the building, relative costs, and the preferences of the community and building owners.

Slide I4. Severely damaged building in Florida panhandle, Hurricane Opal, 1995

This deck is all that remains of a waterfront building destroyed in Hurricane Opal. The deck is now in the surf because of erosion during the storm. This site is now more dangerous than before the hurricane—it is now lower than mean high tide. Building owners often want to rebuild and reoccupy such buildings. Under minimum requirements in floodplain management ordinances, no new structure can be built seaward of the mean high tide line. Existing buildings may be repaired, but you need to consider such decisions carefully. Buildings like this may be candidates for removal.

Slide I5. Deck and pool in front of hotel, Surfside Beach, South Carolina

Structures like decks, pools, and other amenities constructed seaward of hotels and condo complexes sometimes function almost like seawalls, taking the brunt of a storm surge. Like this hotel deck in Surfside Beach, South Carolina, they can be completely destroyed. As you can see, much of the beach has also been eroded away. Research shows that wherever decks and pools

are built seaward of buildings, erosion is accelerated. After a hurricane, the rebuilding of such structures is a local policy issue.

Slide I6. House being moved landward on same lot in Nags Head, North Carolina

This shorefront house in Nags Head, North Carolina is being moved landward on the same lot. There it will be placed on a new foundation and occupied again. Where coastal lots are sufficiently deep, this kind of retreat from the coastline can often be accomplished to avoid damage or as a part of rebuilding after a coastal storm. It is especially needed where coastal erosion is severe. Sometimes, it is less expensive to move a building than to elevate it or try to control future storm damage.

Slide I7. Elevated beach-front houses

Residential building owners have two options for buildings in the floodplain with damage of 50% or more of pre-hurricane market value--removal or elevation. This shows a house in Isle of Palms, South Carolina elevated after Hurricane Hugo. The lowest horizontal structural member of the building must be at or above the base flood elevation which, in the V-Zone, includes an expected wave height of 3 feet. In addition, waves must be able to pass unobstructed between the living area and the ground.

Slide I8. Floodproofed commercial building in St. Petersburg Beach, Florida

In the A-Zone, owners of commercial buildings have the option to floodproof rather than elevate their buildings, even if damaged 50% or more. This shows the Hurricane Restaurant in St. Petersburg Beach, Florida. It has been floodproofed. The bottoms of the windows are higher than the base flood elevation, the door has a flood shield, and all building connections and utilities are protected or sealed.

Slide I9. Pre-FIRM building with less than 50% damage

This pre-FIRM building was damaged less than 50% of its value in a coastal storm. Under minimum floodplain regulations, this building may be repaired without elevation. Approximately 40% of flood insurance claims are for previously damaged properties like this. Pre-FIRM buildings can be damaged 20-30% over and over again, and their owners can repair them and still buy flood insurance. Local governments can intervene by adopting regulations stricter than FEMA's minimum requirements. They may require the removal, relocation, elevation or improved construction of moderately-damaged, pre-FIRM structures in the V-Zone or the A-Zone.

Slide I10. Church flattened by wind in Hurricane Iniki, Kauai, Hawaii

Policies for wind damaged buildings outside the flood zones are not determined by the NFIP; however, they are very important. This shows a church damaged by wind when Hurricane Iniki struck Kauai in 1992. The key decision is what building code standards to apply to repairs. Most codes provide that when a building is damaged 50% or more, it must be demolished or the entire structure brought into compliance with the currently adopted code. Meeting the current code often requires considerable work over and above that needed to repair damage. Property owners struggling to get their lives back together often pressure local officials to waive such requirements. Conflicting needs for speedy recovery and improved safety present local officials with hard decisions.

Slide I11. Historic hotel, St. Petersburg Beach, Florida

Historic buildings need special consideration. This historic Don Ce Sar Hotel in St. Petersburg Beach, Florida is subject to hurricane damage. If damaged, historic buildings like this cannot be removed or altered without review by the State Historic Preservation Officer. The historic integrity of such buildings should be preserved as they are being repaired or brought up to code. Local policy is important in determining what buildings are considered historic and how they can be modified to increase resistance to hurricane damage.

Slide I12. Now begin Task I.

Now turn to the instruction page for Task I. You will also find a table in *Handout I* for recording your policy decisions about hurricane-damaged buildings. You have 40 minutes to complete the task.

Reminder to Facilitator: Be sure to set the timer for 40 minutes.

INSTRUCTIONS -- TASK I. POLICIES FOR DAMAGED BUILDINGS
(Time to complete the task: 40 minutes)

Purpose

Apply or revise provisions in your floodplain management ordinance and building code to determine the fate of hurricane-damaged buildings.

Materials

- Base map with information from Tasks A-H
- Floodplain management ordinance and local building regulations
- *Handout I. Policies for Damaged Buildings*

Steps

1. On the base map, outline in **black** the part of the shorefront that is now probably in the V-Zone because of the loss of shoreline protection structures and beach erosion. In filling out *Handout I. Policies for Damaged Buildings*, consider buildings in this area to be in the V-Zone.

2. In Column 1 of *Handout I. Policies for Damaged Buildings*, enter brief summaries of your current policies as contained in the floodplain management ordinance, local building regulations, and other plans or ordinances relevant to decisions about hurricane-damaged structures.

3. Next, review your current policies and identify any changes you would make to guide repairs, demolitions, and rebuilding after Hurricane Gail. Record your changes in Column 2 of *Handout I.*

4. On *Handout I*, record your decisions about how to handle damaged historic buildings.

5. Are there changes in your existing policies and regulations that could be made now to improve decisions about damaged buildings after the real hurricane? On *Handout 4. Recommended Actions*, list actions that might be taken now to make this task easier after a hurricane.

Products

- Base map showing damaged buildings now in the V-Zone
- *Handout I. Policies for Damaged Buildings*
- Entries on *Handout 4. Recommended Actions*

Handout I

POLICIES FOR DAMAGED BUILDINGS

Damaged Buildings	1 Local Floodplain Management and Code Regulations	2 Your Policy Recommendations
In V-Zone Under 50% Damage: 50% or More Damage:		
In A-Zone Under 50% Damage: 50% or More Damage:		
Outside Flood Zones Under 50% Damage: 50% or More Damage:		

Policies pertaining to repair and reconstruction of damaged historic buildings:

_____

_____

_____

SCRIPT -- TASK J. PERMIT PROCESSING
(You have 5 minutes to read the script.)

Slide J1. Task J. Permit Processing

Task J is to estimate work load and staff needs to process permits for repair and rebuilding after Hurricane Gail and recommend procedures for handling the work load. After a hurricane, the number of applications for building permits is many times the usual volume. You may face pressures to compromise standards and cut short your review to speed the permitting process. Yet, the safety of the rebuilt community depends on maintaining good building practices and competent review of permit applications. Disaster-struck communities often institute temporary moratoria to give staff time to assess damage and establish permitting procedures.

Slide J2. Surf City town hall open on Saturday after Hurricane Fran

Usually some changes in procedures are needed after a hurricane This man is applying for an electrical inspection in the Topsail Island town of Surf City about a week after Hurricane Fran. Access to the island was still restricted to property owners and residents. Town hall staff and volunteers worked long weekend hours to issue permits allowing access to contractors with letters from owners and scheduling and conducting inspections. As electric power was restored to an area, electrical inspections of individual properties were required before service would be restored to that property.

Slide J3. Plan checking

Here are city plan checkers reviewing applications for building permits to repair hurricane-damaged buildings. Local governments usually find they need extra staff to process the heavy volume of permit applications. During the 9 months before Hurricane Andrew, Homestead processed 1,100 permit applications. This increased to 11,000 during the 9 months after the hurricane. To handle this 10-fold increase the Homestead building department staff grew from 3 to 35. Some jurisdictions have hired temporary employees or consultants to supplement their staffs.

Slide J4. One-stop permit center

Some communities set up a one-stop permit center to make the process easier for disaster victims. Other options are to waive public hearings for some types of permits and increase staffing to improve turnaround time. After Hurricane Andrew, Homestead, Florida adopted a temporary ordinance allowing buildings with nonconforming lot sizes, setbacks, or uses to be rebuilt without variances. This eliminated the expense and delays of public hearings required for variance applications. However, such buildings did have to meet all building code standards.

Slide J5. Reconstruction Information Center in the Virgin Islands

This is a FEMA Reconstruction Information Center, known as a RIC, set up by FEMA in the Virgin Islands after Hurricane Marilyn in 1995. Local governments can speed recovery by providing information on techniques for elevating structures and wind-resistant construction. The table is staffed by architects, contractors, and engineers to help building owners learn how to repair typical hurricane damage and, at the same time, add hurricane straps, shutters, and other features to reduce damage in future hurricanes. RICs, supported by FEMA with private participation, are generally a part of normal post-disaster operations.

Slide J6. Now begin Task J.

Please turn to the instructions for Task J. You have 15 minutes to complete this task.

Reminder to Facilitator: Be sure to set the timer for 15 minutes.

INSTRUCTIONS -- TASK J. PERMIT PROCESSING
(Time to complete the task: 15 minutes)

Purpose

Review your organization and procedures to handle plan checks, building permits, and building inspections for repairs and rebuilding.

Materials

- *Handout F. Damage Assessment* and *Handout I. Policies for Damaged Buildings*
- Base map with information from Tasks A-I
- Existing plan check and building permit processing procedures

Steps

1. Based on your estimates of the number of damaged buildings *(Handout F)* and policies for damaged buildings *(Handout I)*, estimate the number of building permit applications you expect for repairs and rebuilding. Enter your estimate below.

   Number of Building Permit Applications: _____

2. From Step 1 above and your knowledge of the permit process, estimate the number of plan checkers, building inspectors, and other staff needed to handle the work load. Enter your estimate below and discuss how you will obtain the help needed.

   Plan Checkers: _____ Building Inspectors : _____ Other: _____

3. List below any changes in procedures you think you will need after a hurricane:

   _____

   _____

   _____

4. What problems do you anticipate in processing permits for repairs? On *Handout 4. Recommended Actions*, list actions that the community might take now to prepare for the work load.

Products

- Estimates of work load and staffing needs
- Recommended changes in permit processing procedures
- Entries on *Handout 4. Recommended Actions*

SCRIPT -- TASK K. RECONSTRUCTION PLANNING
(15 minutes to read the script)

Slide K1. Task K. Reconstruction Planning

In Task K, you will use all the information you have developed so far to prepare a reconstruction plan for the area impacted by Gail's storm surge. This task marks the beginning of a planning and rebuilding process that will dominate staff time and the political agenda for several years to come. In the previous tasks, we explored in increasing detail the damage caused by Hurricane Gail and the fate of individual buildings. Now we stand back and take a broader perspective. The questions you will be asking during this task are: "What are the best uses of the beach front or waterfront in this community?" Can some important public purpose be served by making changes during rebuilding?"

Slide K2. Beautiful, dynamic coastline

The places where land and sea meet are dynamic. The shape of the coastline changes with the ebb and flow of the tide and seasonal variations in the movement of sand. Periodic storms can cause massive and long-term changes in the shoreline.

Slide K3. Baltimore, Inner Harbor

The early European settlers established cities at the end of natural harbors. This shows Baltimore's inner harbor with a blend of old and new development. Natural harbors offer protection from storm surges and good sites for permanent coastal settlements. However, as more and more people seek to live by the coast, they increasingly settle on land without natural protection from sea waves and, in the process of construction, often destroy the protection that nature did provide.

Slide K4. Seawall

When storms come, people in damaged coastal cities and towns typically respond by trying to control the sea. They build seawalls, jetties, groins and other structures to keep the ocean from washing away their beaches, lots, homes and businesses. When the seawalls fail, they build thicker, deeper, higher ones. Over the decades, the sea has consistently won the struggle. Almost invariably, structures designed to prevent beach erosion, ultimately make it worse or shift it elsewhere. Losses from wave damage have been steadily increasing. One reason is that once a control structure is in place, people seem to believe that the shore is now safe, and construction increases. Sooner or later, comes a storm surge larger than the structure was designed to contain. Several states no longer allow hardened shore protection projects such as seawalls.

Slide K5. Context for reconstruction planning

A damaging hurricane gives you a chance to reconsider coastal land uses. This diagram shows how post-hurricane reconstruction planning is linked to typical community planning. Ideally, a community's plan defines land uses and circulation along the coast in relation to the rest of the community. A community plan may contain or be supplemented by a coastal management plan prepared by the state and/or community under the U.S. Coastal Zone Management Act. A post-hurricane reconstruction plan is completed after a damaging hurricane and is essentially a redevelopment plan for the damaged area. It can implement or lead to revision of the community plan and coastal management plan (if there is one).

Slide K6. Galveston, 1900

Replanning coastal land uses is a challenge. Not much change usually takes place because of the high market value of beach-front property based on the huge demand for vacation homes and resorts on the shore. There is always strong pressure to rebuild, sometimes with more density and floor area than before the storm. This shows damage from a 1900 hurricane which struck the City of Galveston, Texas, located on a barrier island in the Gulf of Mexico. The hurricane killed 6,000 people making it by far the deadliest natural disaster in U.S. history.

Slide K7. Galveston, repairs after Hurricane Alicia, 1983

Galveston rebuilt after the hurricane, reassured by the construction of a 15 foot seawall that by 1963 was 10 miles long; by 1980 the population had grown to 60,000. Then, in 1983, Hurricane Alicia struck. The seawall survived this moderate hurricane, but a 7.5 foot storm surge washed over unprotected western Galveston Island causing much damage. The response after Alicia was similar to that after the 1900 hurricane--calls for extending the seawall and increased emphasis on evacuation planning. The main difference is that reconstructed houses, shown here, meet the elevation requirements of the National Flood Insurance Program.

Slide K8. Brownwood subdivision in 1979

One land use change did occur after Hurricane Alicia. This shows a home in the Brownwood subdivision in Baytown near Houston. The subdivision of 300 homes had subsided over 14 feet and was sinking into the Houston Ship Channel because of withdrawal of groundwater. By 1979, as shown here, the homes were flooded often and owners were regular claimants under the National Flood Insurance Program. Twice, the residents turned down bond issues to raise $7 million to match the $32 million the Corps of Engineers committed to purchase the properties and relocate the residents.

Slide K9. House in Brownwood damaged by Alicia, 1983

After Alicia, all the houses were either destroyed or damaged 50% or more. FEMA withheld disaster assistance and coordinated funding to remove the remaining houses and help residents relocate. The people of Brownwood ended up with less than offered in the earlier buy-out proposal. The example illustrates that sometimes the only sensible response is to prevent rebuilding, but, even in extreme cases, this can be opposed.

Slide K10. Damage on Sullivans Island from Hurricane Hugo, 1989

In 1989, Hurricane Hugo battered Sullivans Island located at the mouth of Charleston Harbor. Sullivans Island has 800 houses, all in either a V-Zone or an A-Zone. The island was completely overwashed by Hugo's storm surge and waves. Virtually the entire island was subjected to high velocity flooding, rendering meaningless the distinction between the V- and A-zones.

Slide K11. Elevated house on Sullivans Island

The first response of Sullivans Island to rebuilding was to apply its floodplain management ordinance. Houses damaged 50% or more had to be elevated. Sullivans Island is an old community of summer cottages with a growing permanent population of commuters to Charleston. Before the hurricane, most of the houses were built at grade. Now, most of the houses on Sullivans Island, like this one, are elevated--some higher than required. Town staff found it hard to tell residents who had suffered trauma and loss that they would have to elevate their homes. Insurance generally covered repairs, but not the added cost of elevation--often $5,000 to $10,000. However, the Town consistently applied its ordinance and staff believes the increase in long-term safety more than compensates for the short-term difficulties of enforcement.

Slide K12. New fire station and EOC

Sullivans Island relocated its fire station, shown here, with help from FEMA. The Fire Department used to be located, along with the Police Department, on the end of the island at Town Hall. After Hugo, a new fire station was constructed on relatively high ground in the center of the island with about equal response time to both ends. The building has space, wiring and telephone connections for the Police Department and Town Hall to function during an emergency.

Slide K13. Rolling dunes

The southern end of the beach on Sullivans Island is accreting--gaining sand. Some residents have rolling dunes between their houses and the beach. Because of the growing beaches, the Town does not establish setbacks substantially stricter than those imposed by the State of South Carolina which are based on a calculated annual erosion rate. However, after Hugo, Sullivans Island did grant variances to property owners to build in the required setback from the street so they could move their houses farther back from the ocean.

Slide K14. Map of lots, Sullivans Island

In a very important action, the Town prevents the sale, subdivision, and development of the accreting dunes. Eighty acres of accreted beach-front land, identified on this map with the vertical line pattern, was deeded to the Open Land Trust. The Trust added restrictions to the deed and deeded the land back to the Town. This was done to prevent local politicians from changing the restrictions. The deed cannot be changed without approval of 75% of the island's registered voters. The deed prohibits the Town from selling the land or permitting the construction of buildings and roads, extension of utility lines, and commercial activity on the land. The red line running through the protected zone is the setback line mandated by the state of South Carolina.

Slide K15. Public walkway over dunes

The public benefits significantly from the plan to protect the accreted dunes and beach. The deed allows for public walkways and boardwalks like the one shown here in Sullivans Island. Public access is a persistent problem of coastal land use planning which is nicely resolved in the Sullivans Island dune and beach protection plan. Usually, public parking also needs to be provided.

Slide K16. Myrtle forest

Sand dunes like these provide significant protection from waves. On Sullivans Island the dunes are being covered with a forest of myrtles and other dune vegetation. The vegetation anchors the dune sand, helps absorb the impact of storm waves, and provides habitat for birds and other wildlife. After Hugo, the town adopted an ordinance restricting disturbance of dune vegetation. The myrtles may be kept trimmed to no less than 7 feet and can be trimmed only at certain times of the year. Although some people object to the restrictions because the increasingly dense forest complicates access to the beach and obstructs views from individual properties, most see the restrictions as necessary to protect the island from storm damage.

Slide K17. Damage in Homestead from Hurricane Andrew, 1992

Hurricane Andrew, one of the most costly disasters in U.S. history, did most of its damage inland. Andrew's winds nearly leveled Homestead, Florida, a city of about 27,000 located in south Dade County, about 20 miles inland. Strong inland winds are unusual, but do happen. Charlotte, North Carolina, over 150 miles from the coast, suffered heavy damage from hurricane-force winds in Hurricane Hugo.

Slide K18. Tents and portable toilets

Faced with such devastation, the city spent a long time on early recovery. For weeks, staff helped people protect their buildings from rain and find shelter, food, and the essentials. They also concentrated on removing debris and restoring the water, electric, and waste water treatment systems. Homestead owns its own utility systems and faced a huge task. Power was back on in 42 days and water soon after that. The treatment plant was partly destroyed and had to be rebuilt. It took a year to restore full service.

Slide K19. Community meeting

About three years after the hurricane, the city completed a land use amendment to its comprehensive plan. In the planning process the city discovered it had unusual opportunities to plan with property owners and neighborhood groups for significant improvements. Before the hurricane, about 65% of Homestead households were renters. Many lived in multifamily housing and projects designed for low-income families and some of the housing was in poor condition. The citizens decided they wished to increase the proportion of homeowners in the community.

Slide K20. Row houses before the hurricane

To guide reconstruction, the city formed an organization called HERO, the Homestead Economic Redevelopment Organization, and gave it powers to condemn, purchase, and sell property. Before the hurricane this neighborhood with its rows of very small, box-like houses was a code enforcement and policing problem. The houses were dilapidated and the neighborhood beset with drug abuse and crime.

Slide K21. New single-family homes on the site

The neighborhood was flattened in Andrew and one of HERO's first actions was to acquire and clear the property. In line with the city's wish to increase the share of ownership housing, a developer constructed 18 single-family houses on the site. With help from HUD, the houses are being sold to first-time buyers.

Slide K22. Rebuilt regional park in Homestead

This shows the regional park in Homestead. It was destroyed in the hurricane and in 1995 finally reopened again. With much community input, the park was totally redesigned with new and different facilities than before Andrew. These are just two examples of how Homestead is making civic improvements during rebuilding.

Slide K23. Suggestions for reconstruction planning

This slide summarizes a few suggestions from these examples to keep in mind as you start working on plans for rebuilding after Hurricane Gail.

- Enforce your floodplain management ordinance and building code.

- Identify realistic opportunities for changes in land use. These will be specific and usually achieve community objectives in addition to increased safety.

- Use redevelopment powers. Most rebuilding plans are redevelopment plans using tax increments to help finance public improvements.

- Understand and accept economic realities. Hurricanes change the economics of doing business. It is rarely possible to simply restore things exactly as they were.

- Work closely with private sector. Remember that local governments plan, but the private sector will do most of the rebuilding.

Slide K24. Now begin Task K.

With that as background to stimulate thinking, you are ready to create your own plans for _____ (community). Please turn to the instructions for Task K and *Handout K*. The handout is a table to help you identify opportunities for land use change. You have about an hour to identify opportunities and create a reconstruction plan for a heavily damaged part of your city.

Reminder for Facilitator: Be sure to set the timer for 60 minutes.

INSTRUCTIONS -- TASK K. RECONSTRUCTION PLANNING
(Time to complete the task: 60 minutes)

Purpose

Identify opportunities for land use change and prepare a reconstruction plan for the coast side.

Materials

- Base map with information from Tasks A-J
- *Handout F. Damage Assessment*
- *Handout I. Policies for Damaged Buildings*
- Community plan, Coastal Zone Management plan, redevelopment plans
- Zoning maps and floodplain management ordinance
- *Handout K. Planning Opportunities*

Steps

1. Using the information accumulated on the base map and handouts and your knowledge of the community and its plans, identify opportunities for changes in land use and structures that could improve safety in hurricanes and achieve other community objectives. List the planning opportunities on *Handout K. Planning Opportunities*.

2. On an overlay of the base map, draw a proposed reconstruction plan for a heavily damaged area, including at least the area flooded by Hurricane Gail's storm surge. Show land uses, transportation changes, design features, and other relevant information.

3. Estimate how long you think it would take to complete and adopt a reconstruction plan allowing for public hearings and full citizen participation. How long do you think it will be before the damaged areas of your community are completely rebuilt?

   Months for reconstruction planning: _____ Years for reconstruction: _____

4. What problems did you have in preparing a reconstruction plan? On *Handout 4. Recommended Actions*, list actions that the community might take now to prepare for this task.

Products

- *Handout K. Planning Opportunities*
- Overlay of base map showing major features of the reconstruction plan
- Entries on *Handout 4. Recommended Actions*

Handout K

PLANNING OPPORTUNITIES

Types of Opportunity	Potential Opportunities
Reducing risks from hurricanes; other hazards	
Eliminating nonconforming uses or buildings	
Changing densities, correcting plan/zoning inconsistency	
Realigning or improving roads	
Improving housing conditions or affordability	
Enhancing the local economy	
Upgrading inadequate commercial, industrial, or public facilities	
Improving urban design	
Providing open space, beach access, or parking	
Preserving historic buildings	
Others (list)	

SCRIPT -- TASK L. MITIGATING HURRICANE HAZARDS
(10 minutes to read the script)

Slide L1. Task L Mitigating Hurricane Hazards

Task L explores how recovery can be made easier by reducing the potential for hurricane damage in advance of a hurricane and preparing for recovery tasks. FEMA sets aside an amount equal to 15% of disaster assistance funds for mitigation projects. To qualify for the funds, jurisdictions must have a mitigation plan. You will work out the key features of your mitigation plan in Task L.

Slide L2. Ways to reduce hurricane losses

What is mitigation? It basically means taking sustained actions to reduce the long-term vulnerability to disaster losses. How do you reduce hurricane losses? This usually involves one or more of the categories of actions listed on the slide: building to resist damage, managing land development, providing shoreline protection, and preparing for emergency response and recovery. The rest of this script and *Handout L1* in your packet give examples of the types of activities that fall under each of these categories.

Slide L3. Santa Rosa Island

The flood insurance program relies primarily on elevation requirements to mitigate flood and wave damage. Experience shows that elevating buildings can prevent much damage. A good example is Santa Rosa Island in the Gulf of Mexico off the Florida panhandle. The island, shown here, was given to the State of Florida by the federal government. Three Florida counties have planning jurisdiction over different parts of the island. Land is held publicly and leased for private use. Development regulations and conditions are determined by the counties and incorporated into the land leases.

Slide L4. Elevated buildings on Santa Rosa Island after Hurricane Frederic, 1979

This shows two elevated houses on Santa Rosa Island that escaped serious damage during Hurricane Frederic in 1979. Before Hurricane Frederic, NFIP maps had been done for the island. The architectural and engineering board decided that the FEMA thresholds were too low and adopted regulations considerably stricter than minimum FEMA requirements--deeper piles and higher elevations. When Hurricane Frederic hit, buildings, like these, constructed to the new standards survived. Others, particularly buildings with slab-on-grade foundations, were heavily damaged. After Frederic, the state passed even stricter requirements and these were adopted by the counties and incorporated into the land leases.

Slide L5. Overwash of Santa Rosa Island in Hurricane Opal, 1995

This is an aerial photograph of Santa Rosa Island showing topography, development patterns, and damage after Hurricane Opal in 1995. Most dramatic, you can see how Opal's storm surge overwashed the entire the island.

Slide L6. Santa Rosa Island after Hurricane Opal, 1995

This slide also shows the impacts of Hurricane Opal on Santa Rosa Island. The severely damaged house was constructed at grade. The other house, which was elevated, is essentially undamaged. This was the case throughout the island. Houses constructed to the new standards came through with only minor damage, but the few remaining pre-FIRM houses with slab-on-grade foundations were again heavily damaged.

Slide L7. Damage from Hurricane Andrew in new subdivision

Dade and Broward counties in Florida are rapidly growing and particularly vulnerable to hurricanes. In 1957, both counties adopted the South Florida Building Code with standards designed to resist 120 mph winds. Adoption of a good code is a first step in reducing wind damage, but without good plan checking and building inspection it will not accomplish much. The subdivision in the foreground was nearly leveled by Hurricane Andrew. The other subdivision had only minor roof damage. As stated by the *Miami Herald*, "Damage followed the rigid line of subdivisions, not the whimsy of wind. Construction quality and design largely determined the degree of hurricane damage."

Slide L8. Plan for hurricane-resistant house in Southern Shores

In general, we have made more progress in constructing buildings to withstand wave and flood damage than wind damage. This shows the plans for a house to be built in Southern Shores, North Carolina to demonstrate good building design and construction techniques for wind resistance. The house will feature a moderately pitched roof, strong connections between the rafters and walls and the walls and foundation, impact-resistant glass and reinforced shutters, braces at critical joints, and well-attached roofing. The demonstration house will be used to train building contractors in how to build structures to withstand hurricane winds.

Slide L9. Undergrounding of electric lines

Power outages are frequent on Sullivans Island from thunderstorms, high winds, and simply from salt accumulation on the lines which can cause arcing. Many buildings have emergency generators as a result of the frequent power interruptions. In 1989, Hurricane Hugo knocked out the island's power for many days and in its aftermath, the Town is undergrounding power and telephone lines at the two ends of the island which are most vulnerable to high winds.

Slide L10. Construction of new water system

Before Hugo, Sullivans Island got water from artesian wells and deep wells. Hugo's storm surge permanently contaminated the artesian wells with salt water and, because of loss of power, water could not be pumped from the deep wells. The island clearly needed a new source of water. The Town arranged with the City of Charleston to run a pipe under Charleston Harbor to tap into the city's water supply at James Island. The water is better quality than before and the supply is less vulnerable to disruption by disasters. With these improvements in its utility systems, Sullivans Island expects to be able to restore services more quickly after the next hurricane.

Slide L11. Aerial photo of Seaside, Florida

Reducing hurricane losses by managing land development starts by looking at where new development is located. This shows the recently constructed new community of Seaside in the Florida panhandle on the Gulf of Mexico. The community took a strong hit from Hurricane Opal in September 1995, but came through relatively unscathed. One reason is careful attention to wind resistance in the design and construction. But another big factor is its location 20 to 30 feet above sea level on a bluff which protected it from the storm surge and waves. In the long term, private decisions to build on low-lying land next to the sea often lead to very high public costs for services, shoreline protection, and disaster assistance.

Slide L12. Sanibel Island, Florida

Density restrictions are also useful to limit the population at risk. This shows Sanibel Island off the west coast of Florida with a 1990 population of 5,400. The community has imposed a growth cap based on the number of people that could be evacuated during the warning time before a "typical" hurricane. The cap, originally allowing for the island's population to almost double, has not been challenged in court. For several U.S. barrier islands, the evacuation times are longer than the likely warning period. Growth caps and other density restrictions can help prevent this from happening.

Slide L13. Map showing setback lines

The most common land use management tool used to guide coastal development is setback requirements. The diagram is an example of setback lines. In this case, no buildings, utility extension, or erosion control structures are allowed seaward of the "no construction" line which is set back 20 feet from the frontal dune. Limited uses are allowed between the "no construction" and setback lines. The basis for establishing setbacks differ. South Carolina uses annual erosion rates to establish setback lines, Texas claims public ownership of all land seaward of the dune vegetation line, and Florida establishes a zone of regulation based on the estimated impact of a 100-year storm. Whatever the rationale, the purpose is the same. To prevent unwise development of the most unsafe and fragile coastal property.

Slide L14. Seawall protecting the Montauk lighthouse at the end of Long Island

This shows the lighthouse at Montauk on the end of Long Island in New York. The site was selected by George Washington when he was a young engineer. He estimated the lighthouse would have 200 years before cliff erosion took the site. Actual erosion has been on target and the lighthouse is now protected by a seawall to extend its life. Erosion is a fact of life on most shoreline property. We have spent billions of dollars on seawalls, groins, and such structures to try to control it, but without much long-term success. At best, we may delay the results or shift the problem elsewhere often with unpredictable and costly consequences.

Slide L15. Ocean City, Maryland

In some coastal areas, sand dunes became building pads and are gone. Nothing stands between buildings and the beach. In areas such as Miami Beach and Ocean City, Maryland, shown here, the task of maintaining the beach is continuous. Every year or so sand is trucked or pumped in and spread on the eroding beach to keep it from disappearing and leaving the high-rise resorts and condos at the mercy of the ocean. Without the beach Ocean City would have trouble attracting the tourists that are the city's economic life-blood.

Slide L16. Beach nourishment under way in Captiva Island, Florida

Beach nourishment projects, if well-engineered and maintained, can reduce damages from moderate storms in the short term (about 50 years). Beach nourishment projects are done by the Army Corps of Engineers, state and local agencies and, sometimes, property owners to help protect shoreline development from storm damage and preserve recreational use of the beach. This shows a beach nourishment project under way at Captiva Island, Florida. Such projects generally involve dredging sand from the ocean floor and spreading it over an eroding beach, sometimes recreating dunes as well.

Slide L17. Hurricane recovery exercise under way, Savannah, Georgia

The aim of hurricane hazard mitigation is to reduce hurricane impacts as much as possible, but you will not eliminate them. Local jurisdictions need to prepare and exercise emergency response plans and train their staffs for long-term recovery and rebuilding. This shows this hurricane recovery exercise under way in Savannah, Georgia in the fall of 1996. Training needs to be a regular local government activity to keep staff members current and bring new staff members into the system.

Slide L18. Post-disaster redevelopment planning

The Florida State Land Development Plan requires all coastal jurisdictions to adopt post-disaster redevelopment plans. This means that Florida communities must consider, before a hurricane, the challenges and opportunities we have been exploring today. A model plan and implementing regulations are being prepared by several state, regional, and local agencies.

Slide L19. Lee County All Hazards Protection District and Fund

Lee County, Florida has carried the process a step further by creating a funding mechanism for emergency preparedness and response projects, local match for federal disaster assistance monies, and the acquisition of storm-damaged properties. The County created a special district, called the All Hazards Protection District, which includes all unincorporated land in the county. A tax of one-half mill is levied on all taxable real and personal property within the district and allocated to the fund.

Slide L20. FEMA's E-Net studio

FEMA has established an educational network to convey hazard and recovery information to local governments and others in need of the information. This shows the studio in Emmitsburg, Maryland. Efforts like this to educate the public and support private decisions to reduce hurricane vulnerability are very important parts of any mitigation program. Most mitigation will actually be done by private businesses and individuals. Local governments can help by providing information, incentives, and sometimes requirements.

Slide L21. Now begin Task L.

This is your last task. Throughout the day you have been listing actions to improve your ability to handle the recovery tasks in this exercise. During this task, you will review your recommended actions, select the highest priority ones, and provide additional details about those you select. You have 30 minutes to complete this task. Please turn to the instructions and copies of *Handouts L1, L2, and L3.*

Reminder to Facilitator: Be sure to set the timer for 30 minutes.

INSTRUCTIONS -- TASK L. MITIGATING HURRICANE HAZARDS
(Time to complete this task: 30 minutes)

Purpose

Identify and describe high-priority actions to include in a hurricane hazard mitigation plan, drawing on the entries in *Handout 4. Recommended Actions* and major points from working Tasks A - K.

Materials

- Base map with information from Tasks A-K and all handouts
- *Handout L1. Ways to Reduce Hurricane Losses*
- *Handout L2. High-Priority Action to Reduce Hurricane Damage*
- *Handout L3. Contacts for Technical and Financial Assistance*

Steps

1. Listen to your recorder recap the actions listed on *Handout 4. Recommended Actions.* Review *Handout L1,* discuss the actions, and make changes in the list as needed. Then, check the actions you decide should have the highest priority in a program to reduce hurricane damage or the burdens of recovery. Be sure to check at least 5 actions.

2. For each checked action, fill out a copy of *Handout L2. High-Priority Action to Reduce Hurricane Damage,* indicating who should be responsible for carrying out the action, who should be involved in the decisions, resources needed and available to accomplish it, and when it should be started and completed.

3. Seek information from those present at the exercise to fill out *Handout L3. Contacts for Technical and Financial Assistance.*

Products

- *Handout 4. Recommended Actions* with the high-priority actions checked
- At least five copies of *Handout L2. High-Priority Action to Reduce Hurricane Damage*
- *Handout L3. Contacts for Technical and Financial Assistance*

Handout L1

WAYS TO REDUCE HURRICANE LOSSES

Build to Resist Damage
Enforce floodplain management ordinances.
Adopt and enforce building codes.
Protect infrastructure and utility systems.
Design and construct roads and bridges for wind and wave resistance.

Manage Land Development
Plan and zone for appropriate uses of hazardous areas.
Consider impact on community safety of all land use decisions.
Assure safe access to all new development.
Support expansion of national seashores and land preservation efforts.
Zone to control population density in evacuation zones.
Establish coastal setbacks.

Provide Shoreline Protection
Protect and enhance natural dunes.
Preserve and, if necessary, nourish beaches.
Prevent construction or land uses that disturb natural protection.
Consider impacts of land use decisions on adjacent properties.
Construct seawalls and revetments only in exceptional cases.

Prepare for Emergency Response and Recovery
Prepare emergency response and evacuation plans.
Plan for recovery and reconstruction.
Use exercises to train staff in emergency response and recovery.
Develop programs to increase public awareness of hazards.
Develop education materials for businesses and special populations.

Handout L2

HIGH-PRIORITY ACTION TO REDUCE HURRICANE DAMAGE

Description of the Action

Agencies Responsible for Carrying Out the Action

People and Organizations Who Should be Involved in the Decisionmaking

Resources Needed (funds, expertise, equipment, etc.)

Possible Sources for Resources

Time to Start_____

Time to Complete_____

Handout L3

CONTACTS FOR TECHNICAL AND FINANCIAL ASSISTANCE

The true measure of effectiveness of the Hurricane Mitigation and Recovery Exercise, which you have just completed, will be in the actions that your community now takes. Throughout the day, you have identified potential problems that your community is likely to face following a hurricane. You have also identified a series of high-priority actions that will lessen the impact of those problems, if you pursue them prior to the next hurricane.

FEMA, your state emergency management agency and your state flood plain management agency stand ready to help you carry out these actions. Below is a list of agencies to contact for technical and financial assistance to help your community meet its hurricane-hazard reduction goals. Add the appropriate names and telephone numbers to the list with the help of those present at the exercise. Then, keep this page with your copies of Handout L1. You are now ready to begin implementing the actions!

FEMA REGIONAL OFFICE--location: _____

Telephone Number: _____

Hazard Mitigation Officer: _____

Telephone Number: _____

STATE EMERGENCY MANAGEMENT AGENCY

Telephone: _____

State Hazard Mitigation Officer: _____

Telephone Number: _____

Hurricane Program Officer: _____

Telephone Number: _____

STATE FLOODPLAIN MANAGEMENT AGENCY

Telephone Number: _____

State Floodplain Manager: _____

Telephone Number: _____

Floodplain Management Resource Center--A Service of the Association of State Floodplain Managers, University of Colorado. Telephone: 303-492-6818.

Slide Index

A complete listing of slides used in the exercise follows. The text slides were prepared by Greenhorne & O'Mara, Inc. based on text provided by Spangle Associates. Other sources are noted with numbers in parentheses and credits are given at the end of this section.

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3. Exercise schedule
4. Exercise purpose
5. Topics not covered
6. Hurricane recovery timeline
7. Task structure
8. What players need
9. Getting started

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A3. Saffir-Simpson hurricane scale
A4 Tropical storm tracks, 1995 season (5)
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A6. Hurricane watches and warnings
A7. Map of Florida showing areas alerted for Hurricane Erin, August 1995 (5)
A8. Local emergency manager (2)
A9. NFIP map for the Island of Kauai (1)
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A11. Cars evacuating before Hurricane Opal, 1995 (3)
A12. Evacuating people (3)
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B1. Task B. Emergency Shelter
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C1. Task C. Damage Scenario
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C16. Schematic of house connections creating a continuous load path (5)
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C18. Poor architectural design, Hurricane Iniki, Hawaii, 1992 (1)
C19. Damaged Ben Sawyer Bridge, Hurricane Hugo, 1989 (3)
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D1. Task D. Managing Debris
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F1. Task F. Damage Assessment
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G2. Damaged retail street, Isle of Palms, South Carolina (6)
G3. State Farm Insurance operating from a trailer after Hurricane Andrew (1)
G4. Winn Dixie, chain grocery store (1)
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H1. Task H. Temporary Housing
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H3. Individual debris cleanup (1)
H4. Biltmore Hotel in Coral Gables used for city employees and families, 1992 (15)
H5. Infrastructure being installed for trailer park (1)
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I1. Task I. Policies for Damaged Buildings
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I3. Options for hurricane-damaged buildings
I4. Severely damaged building in Florida panhandle, Hurricane Opal, 1995 (7)
I5. Deck and pool in front of hotel, Surfside Beach, South Carolina (6)
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L7. Damage from Hurricane Andrew in new subdivision (1)
L8. Plan for hurricane-resistant house in Southern Shores (2)
L9. Undergrounding of electric lines (2)
L10. Construction of new water system (5)

L11. Aerial photo of Seaside, Florida (20)
L12. Sanibel Island, Florida (21)
L13. Map showing setback lines (6)
L14. Seawall protecting the Montauk lighthouse at the end of Long Island (9)
L15. Ocean City, Maryland (9)
L16. Beach nourishment under way in Captiva Island, Florida (16)
L17. Hurricane recovery exercise under way, Savannah, Georgia (4)
L18. Post-disaster redevelopment planning (2)
L19. Lee County All Hazards Protection District and Fund (2)
L20. FEMA's E-Net studio (2)
L21. Now begin Task L.

Sources

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